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**Practitioner's Docket No.**

## PATENT

**TRANSMITTAL LETTER TO THE U.S. DESIGNATED OFFICE (DO/US)—  
ENTRY INTO THE U.S. NATIONAL STAGE UNDER CHAPTER I**

PCT/IB98/02046      17 December 1998      24 December 1997

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
METHOD AND MACHINE	FOR SAWING PANELS	WITH Laterally

TITLE OF INVENTION	MOVABLE PUSHER
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BENUZZI, Piergiorgio

**APPLICANT(S)**

### Box PCT

**Assistant Commissioner for Patents**  
**Washington D.C. 20231**

**ATTENTION: DO/US**

**NOTE:** The completion of those filing requirements that can be made at a time later than 20 months from the priority date results from the Commissioner exercising his judgment under the authority granted under 35 U.S.C. § 371(d). The filing receipt will show the actual date of receipt of the last item completing the entry into the national phase. See 37 C.F.R. § 1.491, which states: "An international application enters the national stage when the applicant has filed the documents and fees required by 35 USC 371(c) within the periods set forth in § 1.494 and § 1.495."

**WARNING:** Where the items are those that can be submitted to complete the entry of the international application into the national phase subsequent to 20 months from the priority date, the application is still considered to be in the international stage. And if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (because international application papers are not covered by an ordinary certificate of mailing. 37 C.F.R. § 1.8(2)(xi)).

**WARNING:** Documents and fees must be clearly identified as a submission to enter the national stage under 35 U.S.C. § 371, otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.494(f).

**WARNING:** Failure to pay the national fee within 20 months from the priority date will result in the abandonment of the application. The time for payment of the basic fee is not extendable. M.P.E.P. § 1893.01(a)(1), 6th ed., rev. 3.

**CERTIFICATION UNDER 37 C.F.R. § 1.10\***

**(Express Mail label number is mandatory.)**

**(Express Mail certification is optional.)**

I hereby certify that this Transmittal Letter and the papers indicated as being transmitted therewith is being deposited with the United States Postal Service on this date August 10, 1994, in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EE367495173, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Sally A. Wohlford

(type or print name of person mailing paper)

Sally M. Whelple

**Signature of person mailing paper**

**WARNING:** Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

**\*WARNING:** Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).

*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

(Transmittal Letter to the United States Designated Office (DO/US)—Entry into National Stage under  
35 U.S.C. § 371 [13-6]—page 1 of 7)

09/367244

510-Rec'd PCT/PTO 10 AUG 1999

1. Applicant herewith submits to the United States Designated Office (DO/US) the following items under 35 U.S.C. § 371:

- a. ☒ This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).
- b. ☒ The U.S. National Fee (35 U.S.C. § 371(c)(1)) and
- ☒ other fees (37 C.F.R. § 1.492), as indicated below:

2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
<input checked="" type="checkbox"/> *	TOTAL CLAIMS	16 —20=	0	×\$ 18.00=	\$ 0
	INDEPENDENT CLAIMS	1 —3=	0	×\$ 78.00=	0
	MULTIPLE DEPENDENT CLAIM(S) (if applicable) + \$260.00				
BASIC FEE**	The international search fee, as set forth in § 1.445(a)(2) to be paid to the US PTO acting as an International Searching Authority: <input type="checkbox"/> has been paid (37 CFR 1.492(a)(2)) ..... \$760.00 <input type="checkbox"/> has not been paid (37 CFR 1.492(a)(3)) ..... \$970.00 <input checked="" type="checkbox"/> where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 CFR 1.492(a)(5)) ..... \$840.00				840
	Total of above Calculations				= 840
SMALL ENTITY	Reduction by ½ for filing by small entity, if applicable. Affidavit must be filed also. (note 37 CFR 1.9, 1.27, 1.28)				- 420
	Subtotal				420
	Total National Fee				\$ 420
	Fee for recording the enclosed assignment document \$40.00 (37 CFR 1.21(h)). (See Item 10 below). See attached "ASSIGNMENT COVER SHEET (37 C.F.R. § 3.34)".				40
TOTAL	Total Fees enclosed				\$ 460

\* See attached Preliminary Amendment Reducing the Number of Claims.

(Transmittal Letter to the United States Designated Office (DO/US)—Entry into National Stage under 35 U.S.C. § 371 [13-6]—page 2 of 7)

09/36724  
510 Rec'd PCT/PTO 10 AUG 1999

**\*\*WARNING:** "To avoid abandonment of the application, the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 20 months from the priority date: \* \* \* (2) the basic national fee (see § 1.492(a)). The 20-month time limit may not be extended." 37 C.F.R. § 1.494(b).

- Two (2)
- i. ☒ A check in the amount of \$ 40 & 420 to cover the above fees is enclosed.
- ii. ☐ Please charge Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_

A duplicate copy of this sheet is enclosed.

**WARNING:** If the translations of the international application and/or the oath or declaration have not been submitted by the applicant within twenty (20) months from the priority date, the applicant will be so notified and given a period of time within which to file the translation and/or oath or declaration in order to prevent abandonment. The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than twenty (20) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than twenty (20) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 will apply. 37 C.F.R. § 1.494(c).

3. A copy of the International application as filed (35 U.S.C. § 371(c)(2)):
- a. ☐ is transmitted herewith.
- b. ☐ is not required, as the application was filed with the United States Receiving Office.
- c. ☒ has been transmitted
- i. ☒ by the International Bureau. Date of mailing of the application (from form PCT/IB/308): 08 July 1999
- ii. ☐ by applicant on \_\_\_\_\_  
Date

**NOTE:** Section 1.494(b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 20 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies the applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage and applicant has received notice from the International Bureau, applicant need only pay the basic national fee by 20 months from the priority date." [This can now be paid subsequently with a surcharge.] Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35.

4. ☒ A translation of the International application into the English language (35 U.S.C. § 371(c)(2)):
- a. ☐ is transmitted herewith.
- b. ☒ is not required as the application was filed in English.
- c. ☐ was previously transmitted by applicant on \_\_\_\_\_  
Date

5. ☒ Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: The Notice of January 7, 1993 indicates that 37 C.F.R. § 1.494(d) was "amended to clarify the existing practice that PCT Article 19 Amendments must be submitted by 20 months from the priority date, which time may not be extended." This Notice further advises: "Of course, the failure to do so does not result in loss of the subject matter of PCT Article 19 amendments. The applicant may submit that subject matter in a preliminary amendment filed under Section 1.121. In many cases, filing an amendment under Section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 35. See item 11(c) below. See also 37 C.F.R. § 1.494(d).

- a. ☐ are transmitted herewith.
  - b. ☐ have been transmitted
    - i. ☐ by the International Bureau. Date of mailing of the amendment (from form PCT/IB/308): \_\_\_\_\_
    - ii. ☐ by applicant on \_\_\_\_\_  
Date
  - c. ☒ have not been transmitted, as
    - i. ☐ no notification has been received that the International Search Authority has received the Search Copy.
    - ii. ☐ the Search Copy was received by the International Searching Authority, but the Search Report has not yet been issued. Date of receipt of Search Copy (from form PCT/ISA/202): \_\_\_\_\_
    - iii. ☒ applicant chose not to make amendments under PCT Article 19. Date of mailing of Search Report (from form PCT/ISA/210): 19 March 1999
    - iv. ☐ the time limit for the submission of amendments has not yet expired. The amendments, or a statement that amendments have not been made, will be transmitted before the expiration of the time limit under PCT Rule 46.1.
6. ☒ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. § 371(c)(3)):
- a. ☐ is transmitted herewith.
  - b. ☐ is not required as the amendments were made in the English language.
  - c. ☒ has not been transmitted for reasons indicated at point 5(c) above.
7. ☒ An oath or declaration of the inventor, including power of attorney, (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115
- a. ☐ was previously submitted by applicant on \_\_\_\_\_  
Date
  - b. ☒ is submitted herewith, and such oath or declaration
    - i. ☒ is attached to the application.
    - ii. ☐ identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or (c) and 5(b); and states that they were reviewed by the inventor, as required by 37 C.F.R. § 1.70.
    - iii. ☐ will follow.

(Transmittal Letter to the United States Designated Office (DO/US)—Entry into National Stage under 35 U.S.C. § 371 [13-6]—page 4 of 7)

**Other document(s) or information included:**

8. ☒ An international Search Report or Declaration under PCT Article 17(2)(a):
- ☐ is transmitted herewith.
  - ☒ has been transmitted by the International Bureau. Date of mailing (from form PCT/IB/308): 08 July 1999.
  - ☐ is not required, as the application was searched by the United States International Searching Authority.
  - ☐ will be transmitted promptly upon request.
  - ☐ has been submitted by applicant on \_\_\_\_\_  
Date
  - ☐ is not transmitted, as the international search has not yet issued.
9. ☒ An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:
- ☐ is transmitted herewith.  
Also transmitted herewith is (are)  
☐ Form PTO—1449 (PTO/SB/08A and 08B)  
☐ Copies of citations listed
  - ☒ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).
  - ☐ was previously submitted by applicant on \_\_\_\_\_  
Date
10. ☒ An assignment document is transmitted herewith for recording. A separate ☒ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO—1595 is also attached.
- ☒ Please mail the recorded assignment document to:
- ☒ the person whose signature and address appears below.
  - ☐ the following:

11. ☒ Additional documents
- ☒ Copy of request (PCT/RO/101)
  - ☒ International Publication No. W099/33600
    - ☒ Specification, claims and drawing
    - ☐ Front page only
  - ☒ Preliminary amendment (37 C.F.R. § 1.121)
  - ☐ Other

12. ☒ The above checked items are being transmitted
- ☐ before the 18th month publication.
  - ☒ after publication and the article 20 communication, but before 20 months from the priority date.
  - ☐ after 20 months (revival).

NOTE: Petition to revive (37 C.F.R. § 1.137(a) or (b)) is necessary if 35 U.S.C. § 371 requirements are submitted after 20 months.

13. ☐ Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on \_\_\_\_\_ namely:  
Date

### AUTHORIZATION TO CHARGE ADDITIONAL FEES

**WARNING:** Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

- ☒ The Commissioner is hereby authorized to charge the following additional fees that may be required by this paper and during the entire pendency of this application to Account No. 06-0308.

- ☒ 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

**WARNING:** Because failure to pay the national fee within 20 months without extension (37 C.F.R. § 1.494(b)(2)), results in abandonment of the application, it would be best to always check the above box.

- ☒ 37 C.F.R. § 1.492(b), (c), and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment, prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

- ☐ 37 C.F.R. § 1.17 (application processing fees)
- ☐ 37 C.F.R. § 1.17(a)(1)-(5) (extension fees pursuant to § 1.136(a)).

(Transmittal Letter to the United States Designated Office (DO/US)—Entry into National Stage under 35 U.S.C. § 371 [13-6]—page 6 of 7)

- ☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b)).

**NOTE:** Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

**NOTE:** 37 C.F.R. § 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying or at the time of paying . . . issue fee. . . ." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

- ☐ 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 20 months after the priority date.

  
Signature of practitioner

Reg. No. 24,175

MINNICH, Richard J.

Tel. No.: ( 216 ) 861-5582

(type or print name of practitioner)  
FAY, SHARPE, FAGAN,  
MINNICH & McKEE

Customer No.:

P.O. Address  
1100 Superior Avenue  
Seventh Floor  
Cleveland, Ohio 44114-2518

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Piergiorgio Benuzzi  
Serial No. : Unknown  
Filed : Herewith  
Title : METHOD AND MACHINE FOR  
SAWING PANELS WITH  
LATERALLY MOVABLE PUSHER  
Attorney Docket : BUG 2 106  
Assistant Commissioner For Patents  
Washington, D.C. 20231  
BOX PCT  
Attention: DO/US

PRELIMINARY AMENDMENT

Dear Sir:

Prior to substantive examination of the above-identified patent application, please amend the application as follows:

IN THE ABSTRACT:

Please add new page 23 (attached hereto) which contains the Abstract of the Invention for the subject case.

IN THE CLAIMS:

**Please amend claim 16 as follows:**

16. (Amended) The method according to [the previous] claim 15, characterized in that:

the pickup elements (16a, 16b,...16n) used to implement it are mounted on the movable device (6;6a) in such a way that all of them, except one, if necessary, can be moved by drive means (36) in a horizontal direction (H) at right angles to the feed direction (F;F2);

at least one of the pickup elements (16b...16N-1) is mounted in such a way that drive means (38) can move it in the feed direction (F;F2) in both directions (K) relative to the movable device;

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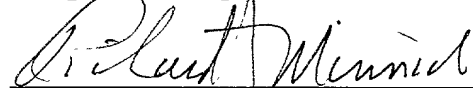
at least one of the pickup elements (16b...16n-1) is mounted in such a way that drive means (39) can move it in a vertical direction (Z);

said movements making it possible for the movable device (6;6a) to return in a direction opposite the forward feed direction (F;F2) and pass over a panel positioned on the table (5); with some of the pickup elements, the ones labelled (162), having risen to a given height along the axis (Z) so as not to interfere with said panel, and some of the pickup elements, the ones labelled (161), having moved crossways in the horizontal direction (H) to a lateral position outside the area occupied by the panel.

REMARKS

It is respectfully submitted that the subject application is now in better condition for examination.

Respectfully submitted,



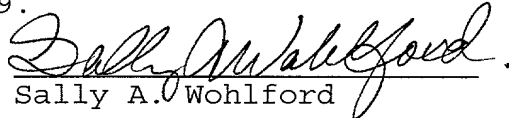
Richard J. Minnich  
Reg. No. 24,175

FAY, SHARPE, FAGAN,  
MINNICH & McKEE  
1100 Superior Avenue  
Seventh Floor  
Cleveland, Ohio 44114-2518  
(216) 861-5582

CERTIFICATE OF MAILING

I hereby certify that this Preliminary Amendment is being deposited with the United States Postal Service as Express Mail No. EL367495173 addressed to: Assistant Commissioner For Patents, Washington, D.C. 20231, on

August 10, 1999.



Sally A. Wohlford

**PATENT**

Attorney's Docket No. \_\_\_\_\_

Applicant or Patentee: GIBEN IMPIANTI S.p.A.

Serial or Patent No.: 0 / \_\_\_\_\_

Filed or Issued: \_\_\_\_\_

For: Method and machine for sawing panels with laterally movable pusher

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY  
STATUS (37 CFR 1.9(f) and 1.27(c))—SMALL BUSINESS CONCERN**

I hereby declare that I am

- ☐ the owner of the small business concern identified below:  
☒ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN GIBEN IMPIANTI S.p.A.

ADDRESS OF CONCERN Via Garganelli, 24  
40065 PIANORO (Bologna) - ITALY

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed, to and remain with the small business concern identified above with regard to the invention, entitled

Method and machine for sawing panels with laterally movable pusher

by inventor(s) BENUZZI Piergiorgio

described in

- ☒ the specification filed herewith.  
☐ application serial no. 0 / \_\_\_\_\_, filed \_\_\_\_\_  
☐ patent no. \_\_\_\_\_, issued \_\_\_\_\_

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention is listed below\* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

\*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27).

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

☐ INDIVIDUAL

☐ SMALL BUSINESS CONCERN

☐ NONPROFIT ORGANIZATION

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

☐ INDIVIDUAL

☐ SMALL BUSINESS CONCERN

☐ NONPROFIT ORGANIZATION

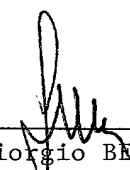
I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small business entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING Piergiorgio BENUZZI

TITLE OF PERSON OTHER THAN OWNER Managing Director

ADDRESS OF PERSON SIGNING Via dell'Angelo Custode, 7  
40121 BOLOGNA - ITALY

SIGNATURE  Date July 30, 1999  
(Piergiorgio BENUZZI)

DescriptionMETHOD AND MACHINE FOR SAWING PANELS WITH LATERALLY MOVABLE PUSHERTechnical Field

The present invention relates to a panel sawing machine. The invention can be used in particular, but not solely, to cut panels, slabs or sheets made especially of wood-based materials but also of plastic, light metal alloys, steel and composite and mineral-bonded board, in order to form smaller boards.

The invention applies in particular to machine for sawing wood-based materials and comprising a horizontal table on which a movable device, usually known as pusher, can push at least one panel to a device downstream for sawing (or rotating) the panel, where, during the sawing operation, the panel is positioned by suitable pickup elements which grip the rear edge of the panel, and including any additional positioning, aligning, outfeed, pressing and rotating elements that constitute the standard equipment of these machines.

Background Art

Known machines of this kind are normally equipped with a plurality of pickup elements, for example of the gripper type, mounted side by side in a given direction at right angles to the forward (or reverse) feed direction of the panels and acting on the rear edge of the panels to be cut.

These known panel sawing machines are used to cut panels of various sizes, both in width and length, usually placed one over the other in normally large stacks whose dimensions depend on the size of the panels made by the panel forming machines.

Conventional panel sawing machines may be of the simple type, with a single cutting axis, called lengthways axis, located downstream of the pusher, or more complex, with two (or more) cutting axes at an angle to each other and with panel feed tables positioned at 90° to each other. In these more complex machines,

the cutting axes are downstream of the corresponding pushers, the first axis being called the lengthways axis and the second, the crossways axis.

In these known machines, the same pusher can also be used to saw two or more stacks of panels or boards in succession. In addition, stacks of different sized boards placed side by side can only be sawn simultaneously if the cutting line of the different stacks corresponds with the machine cutting axis concerned (creating what is usually known as a logical cutting pattern). If the cuts are not consistent (creating differentiated cutting patterns) several pushers may be provided, each acting on one (or more) board/boards or portion of panel and resulting in constructional complications and additional costs for the entire machine.

Depending on the size (whether initial or derived from pre-cuts) of the stack of panels or group of boards to be sawn, the machine must be equipped with a suitable number of pickup elements appropriately positioned and distributed along the entire rear edge of the related stack or group of boards so as to firmly hold the panels along the entire width and to line them up securely against a stop surface during the sawing operation.

One of the disadvantages of known panel sawing machines is that all of them are set up and equipped to cut a limited number of sizes of panel stacks or groups of panel stacks. This is accomplished by mounting on the pusher crossbeam a variable number of pickup elements or grippers, depending on the requirements of the end user. In other words, the manufacturer equips the pusher crossbeam with a number of pickup elements or grippers, variously distributed along the length of the beam, at fixed positions, using the smallest number of elements possible in order to reduce costs.

These machines are therefore rather inflexible in terms of size changeover and hence are not suitable for cutting panels of many different sizes unless fitted with complex equipment, which considerably raises construction costs and requires expensive tooling; not to mention the fact that, although machines of this kind are long-term investments, its capabilities are unable to

satisfy process requirements after many years in operation, not least because of the diverse and constantly changing market requirements.

5     Disclosure of the Invention

          The present invention has for its principal object to overcome the disadvantages of prior art by providing a panel sawing machine, with either one or two (or more) cutting axes, that can be adjusted in an extremely simple and practical manner  
10     to work on panels or boards or groups of boards of any size.

          One advantage of the present invention is that it permits two or more panels and/or boards in stacks placed side by side to be cut lengthways or crossways (depending on which machine axis is being used) even if the adjacent panels and/or boards must be sawn  
15     into smaller boards or panels differing in length and width from one panel or board to the next.

          Another advantage is that it provides a machine that can be used to make boards of various sizes both in width and length with a relatively small number of cutting operations and allowing  
20     considerable saving of time.

          The above mentioned aims and advantages are all achieved by the present invention as characterized in the claims below.

          Other characteristics and advantages of the invention are made more apparent in the detailed description which follows, with  
25     reference to the accompanying drawings, which illustrate a preferred embodiment of the invention and in which:

          - Figure 1 is a schematic top plan view of a machine made in accordance with the present invention and being of the type with a single, lengthways cutting axis;

30     - Figure 2 is a scaled-up, right-hand side view of a detail of Figure 1;

          - Figures 3a to 3f are schematic top views of possible cutting configurations using two grippers in accordance with the present invention;

35     - Figures 4a to 4d1 are schematic top views of possible working configurations of the machine illustrated in Figure 1,

differing according to the size of the panels to be cut and the characteristics of the machine itself;

- Figures 5a to 5u are schematic top views of possible working configurations of a machine with two (angular) cutting axes, differing according to the size of the panels to be cut and the characteristics of the machine itself.

- Figures 6a to 6f are schematic top views of different stages in the cutting operations that can be carried out with the machine disclosed by the present invention.

With reference to Figure 1, the numeral 1 indicates as a whole a panel sawing machine with a single, lengthways cutting axis used normally to cut whole panels 30 of large size (such as that illustrated) or panels 3a and 3b placed side by side. In the present description, reference is made to the cutting of panels made of wood or from a wood-based material but without thereby restricting the scope of the invention.

The machine 1 is designed to cut panels 30 or 3a, 3b into smaller boards 31 or 4a, 4b, respectively, having the same or different width L.

The machine 1 comprises a horizontal table 5 that supports at least one panel to be cut. The table is made in such a way as to permit the panel to easily slide on it in a forward feed direction, indicated by the arrow F, or in the opposite direction F1, in the case of a panel or stack of panels fed from the machine front/operator side OP (as described in more detail below). In this particular case, the table 5 is loaded by conventional feeding and loading means (not illustrated) with one or more stacks of panels. By way of example, Figure 1 shows two stacks 2a and 2b of panels placed side by side, which, alternatively, might constitute a single stack 2 (see Figure 2) not larger in size than the sum of the dimensions of the stacks 2a and 2b.

The panel table might, for example, comprise a plurality of idle rollers turning about axes perpendicular and/or parallel to the feed direction or, in another preferred embodiment, illustrated in Figure 2, the table may comprise a plurality of brush-like supporting elements 20 (either low-friction fibre or air-cushion), the tops of which form a horizontal surface on which

the panels can slide. The table may also be equipped with a rotation device, illustrated schematically and labelled R, which, when necessary, turns the panel through 90°, as described in more detail below with reference to the illustrations showing the different process stages. In the most simple embodiment, the rotation device may consist of a gripper which grips a corner of the panel and moves in direction F, F1 so as to turn the panel.

The machine is equipped with means for moving the panels along the table 5 in the feed direction F or F1, said means comprising a movable device 6 designed to push the panels 3 or 3a, 3b along the table 5 in direction F (or to pull them in direction F1) towards a lengthways sawing device 7 designed to divide the panels into smaller boards. The pusher 6 consists essentially of a crossbeam able to move in the feed direction F (or F1) in steps of preset length in such a way as to feed stacks 2 or 2a, 2b of panels to the sawing device 7. During stops between one step and the next, the sawing device 7 cuts the stacks of panels at right angles to the feed direction F.

The numeral 50 indicates air-cushion tables located on the operator side OP and designed to support and receive the panels feeding into or out of the sawing device 7. The letters SX and DX indicate the zero reference lines for the left-hand and right-hand sides of the machine, respectively.

The boards 4 or 4a, 4b feeding out of the sawing device 7 are then transferred to further process stations which are not illustrated in the drawings.

The pusher 6 has at least one pickup element 16 designed to hold the panels in position during the sawing operation. Each pickup element 16 acts on a part of the rear edge of a panel and prevents the edge from moving while the panel is being sawed.

The device 6 is preferably equipped with a plurality of pickup elements (as illustrated in Figure 1) placed side by side in a horizontal direction at right angles to the panel feed direction. Each pickup element may, for example, comprise a gripper consisting of a first clamping part 17 designed to press down on the edge of the panel at the top of the stack and a second clamping part 18 which acts on the lower edge of the panel: in

this case, the clamping parts 17 and 18 work together to form two jaws that hold the entire stack by its rear edge.

The clamping parts 17 and 18 are actuated by conventional drive means, illustrated schematically in Figure 2, such as a fluid drive unit 16a.

Figure 1 shows a plurality of pickup elements 16, irregularly spaced apart in a direction at right angles to F. In the case illustrated here, the distribution of the elements is more concentrated on the left-hand side, which is the reference side SX for the sawing of the stack of panels, although the right-hand reference side DX could also be used, as described below. Preferably, for the convenience of modular construction, all the pickup elements are identical.

According to the present invention, at least one of the pickup elements 16 (or better still, all of them except the first from the left, labelled 160) must be mounted on the pusher 6 in such a way as to be able to move crossways in both directions, in a horizontal direction indicated by an arrow H in Figure 1, at right angles to the direction of feed.

This could be achieved by a sliding fit between the pickup element 16 and a first straight, horizontal guide 15, integral with the pusher 6 and schematically represented in Figure 2.

Means, illustrated schematically in Figure 1 and labelled 36, are also envisaged for controlling the left and right crossways movements of the different pickup elements 16. These control means may, for example, consist of a helical guide 36a, integral with the crossbeam 6 and engaged by a power-driven unit, labelled 36b, operated by a lead screw and integral with each pickup element 16. These control means are computerized and designed to locate the pickup elements along the rear edge of a panel at the positions most suitable to ensure a safe and secure hold on the panel, however wide the latter is and whatever its crossways position relative to the table.

In this regard, Figures 3a to 3f schematically illustrate six different positions that may be assumed by two pickup elements 16 according to the number and size of the panels 3 to be sawed. In practice, by appropriately positioning a relatively small

number of pickup elements 16 (in this case, only two) in a crossways direction, panels 3 of any size can be held in position while they are being sawed.

Thanks to this controlled positioning solution, only a few elements 16 are needed to securely hold two or more panels placed side by side, to be sawed at the same time by the same sawing device or sets of different sized panels fed in one after the other. That makes for a practically universal machine that can be used for panels of any size and that can be controlled by an operator (or by a control system capable of recognizing panel dimensions) through simple setting operations that require very little time and hence result in negligible down time.

Figures 3a to 3f are simple illustrations of how panels of different sizes can be handled using only two pickup elements, which is the minimum number of elements required.

Figures 3a to 3c show some possible working configurations of the grippers on the pusher 6 that differ according to the width of the boards to be cut: notice that the grippers are located at the positions most suited to the width of the board or stack of boards.

In the case of a single board, as shown in Figure 3a, gripper 16a alone is sufficient, while in the case of two boards 3 side by side, as shown in Figure 3b, the gripper 16b must also be used. Similarly, in the example illustrated in Figure 3c, where each of the grippers 16a, 16b is used to hold two (or more) thinner half-boards, the size and carrying capacity of the grippers are such as to enable more than one board (Figure 3c shows two) to be simultaneously pulled in direction F1 or pushed in direction F.

Figures 3d to 3f, on the other hand, show the grippers on the pusher 6 positioned differently according to the different sizes of a single large panel 3. Again, notice that the grippers are located at the positions most suited to the dimensions of the panel or stack of panels both in the lengthways direction (Figures 3e, 3f) and in the crossways direction to enable them to be pre-cut (see Figure 3d).

Another feature of the invention is that at least one of the pickup elements 16, the one labelled 161 in Figure 2, may move not only crossways relative to the pusher 6, in direction H, but also lengthways in the both the forward or reverse feed directions, labelled K. The pickup element 161 is preferably positioned below the crossbeam 6, for structural reasons to enable it to move to the different positions, as described in more detail below. It moves in H by means of a second guide 15a and in K by means of a similar third guide 15b, each having a corresponding drive unit, also of known type, and represented conventionally as 38a and 38b.

There may be one or more pickup elements 161 able to make controlled movements in direction K, in which case each pickup element 161 must be equipped with drive means allowing it to move independently of the others.

Figure 2 shows that one or more of the elements 16, in this case labelled 162, may also move in a vertical direction Z along a fourth guide 15 and actuated by drive means 39: that means that the gripper concerned can be raised from the table so that the pusher crossbeam can return to the ready, retracted position by moving over the panel or stack of panels still being machined without touching it. This feature is described in more detail below.

The forward and return movements of the pickup elements 16, as well as their sideways and vertical movements along the three axes H, K and Z are controlled by a conventional, computerized controller unit (not illustrated) which drives all the machine axes.

Different working configurations that can be obtained with the machine described above will now be described with the aid of the schematic drawings of Figure 4.

In Figures 4a to 4f, the process cycle of the panel sawing machine envisages a single, lengthways cutting axis with loading of panels (or stacks of panels, from now on called just panels for convenience) from the front, that is, from the operator side OP. The grippers (see Figure 4a) are moved into position so as to be regularly spaced out in H along the length of the panel, referenced to the right-hand zero line DX: once the grippers 16

have got hold of the panel, the pusher moves back in direction F1. In Figure 4b, the pusher crossbeam pushes the panel in direction F for a first trimming cut T1, a second lengthways cut (at least one) T2 and a final trimming cut T3 (see Figure 4c). In Figure 4d, after the operator OP has turned the boards resulting from the cutting of the panel, the pusher moves back in direction F1 and the grippers have moved to the new position to hold the boards (in this example, there are two boards), this time referenced to the left-hand line SX. The pusher (see Figure 4e) pushes the boards to the first trimming cut T4 in direction F and then, see Figure 4f, continues moving forward in direction F so that at least one crossways cut T5 can be made: in this case, however, one or more of the grippers (in this illustration, only the one labelled 161) must also move in direction K so as to allow different positions relative to the pusher crossbeam 6 which continues to move in direction F.

The process cycle illustrated in Figures 4g to 4r refers again to a panel sawing machine with a single, lengthways cutting axis and panel loading from the front, that is, from the operator side OP, but in this case having also an independent rotating device R. The grippers (see Figure 4g) are moved into position so as to be regularly spaced out in H along the length of the panel, referenced to the right-hand zero line DX: once the grippers 16 have got hold of the panel, the pusher moves back in direction F1. In Figure 4h, the pusher positions the panel according to a preset 0 rotation PT, the grippers 16 open, the pusher moves back a little and the grippers rise. The rotation device R (in practice a jointed gripper) now comes into operation, the device R illustrated in this example being of the linear type that moves along the axis of F1 and, in combination with a locating reference element B1 (in practice an opposing roller) rotates the panel through 90° (see Figure 4i). During the combined movement of the rotation device R and of the reference element B1, the pusher and the gripper move to a new position that will enable them to catch hold of the short side of the panel. The pusher moves forward (see Figure 4j), the grippers hold the panel by its short side and the pusher positions the panel first for trimming and then for the

pre-cut (or pre-cuts, see Figure 4k), after which the gripper 162 rises (see Figure 4l), while the outer right-hand gripper 16 and the pusher move to the left-hand zero position SX to be able to catch hold of and pull the pre-cut board (or boards) in direction F1. In the meantime, the rotation device R moving in direction F and the locating reference element B1 are free to rotate the panel again. Continuing the cycle, the pusher (see Figure 4m), with the gripper 16 located at the left-hand zero line SX, pulls the pre-cut board back in direction F1, past the cutting line and then (see Figure 4n) forward again in direction F to be cut crossways where required. When all the crossways cuts have been completed, the gripper 16 used up to now (see Figure 4o) also moves in H to a position where it can catch hold of the main portion of the panel previously rotated. When all the elements are in the correct position, the pusher proceeds in direction F to allow the lengthways cuts to be made where required (see Figure 4p) with reference to the right-hand zero line DX, the various different boards reaching the air-cushion table at the end, after which the grippers and the pusher move to the pickup position referenced to the opposite, left-hand side SX again. Notice, in Figure 4q, that the grippers have moved crossways in H to the position from which they can catch hold of the boards to pull them back past the cutting line. Finally, as shown in Figure 4r, the pusher moves forward, while the specially equipped gripper 161 moves forward or back along the axis K to permit the crossways cuts to be made along cutting lines that are at different distances from the ends of the panels.

The process cycle illustrated in Figures 4s to 4d1 again refers to a panel sawing machine with a single, lengthways cutting axis but in this case with a loader (or loading platform), labelled CA, located on the side opposite the air-cushion table 50. In Figure 4s, the whole panel is placed upstream of the panel saw and is then (see Figure 4t) transferred in direction F and aligned with the 0 PT both lengthways and crossways by the rotation device R (optional) and the reference element B1. Next, (see Figure 4u) the grippers rise in direction Z and the pusher is positioned in direction F1 to wait for the panel which is being

rotated. The grippers, referenced to the right-hand zero line DX (see Figure 4v) stop the panel after it has been rotated and the pusher moves forward in direction F (see Figure 4w) to make one or more cuts, after which the panels are rotated on the air-cushion table. The grippers not used at this stage are the one labelled 162, which rises in direction Z (see Figure 4x) and the one labelled 16 which will be used for the subsequent cutting of the boards moves in H with reference to the left-hand zero SX. In Figure 4y, the panel is rotated again and, at the same time, the pusher moves back in direction F1 with reference to the left-hand zero SX, taking the pre-cut board past the cutting line. The pusher then moves forward again (see Figure 4z) in steps to position the board so that it can be cut crossways at T10. In Figure 4a1, the pusher and the grippers move (in directions F and H, respectively) to catch hold of the main portion of the panel referenced to the right-hand zero DX and make the lengthways cuts T11. Next (see Figure 4b1), the boards cut in this way are rotated by the operator through 90° on the air-cushion table while the pusher and the grippers move back to the left-hand reference zone SX to catch hold of the boards. Lastly (see Figures 4c1 and 4d1) the pusher moves back to carry the boards past the cutting line and then forward in direction F again to position them for the crossways cuts not before the gripper 161 has moved along K to allow the two (or more) boards to be cut at the same time into different lengths relative to the pusher 6.

Figures 5a to 5u illustrate an angular panel sawing machine, that is, having two cutting axes, labelled 7 and 7a, at right angles to each other, the former called lengthways cutting axis and the latter, crossways cutting axis. The lengthways section of the machine has a pusher 6, with grippers 16, loading table CA, zero reference line SX (referred to as being on the left since the feed directions of the panel make an angle that coincides with the machine angle, which is on the left-hand side), and with cutting feed direction F. The crossways section of the machine has a pusher 6a, with grippers 16t and 161t, zero reference line SXt and cutting feed direction F2 (see Figure 5a).

After being fed in in direction F (see Figure 5b), the first panel or stack of panels is pushed by the pusher 6 to the 0 PT position (optional) for the rotation device R and reference element B1, while the second panel 3a is ready on the loader CA.

5 The panel is rotated (see Figure 5c) while the pusher 6 moves back with the grippers 162 raised in direction Z so as not to interfere with the rotation of the panel. Then (see Figure 5d), the grippers 16 and 162 move into position in H to adapt to the length of the short side of the panel 3. The grippers 16 and 162 must therefore

10 be able to move in directions H and Z. In the next step (see Figure 5e), the pusher 6 moves in direction F to enable the panel to be cut into boards S1 along the axis 7. The boards S1 are then immediately gripped by the grippers 16t and 16lt of the crossways section, which move in direction F2 towards the second cutting

15 line 7a: in this configuration, the gripper 16t preferably, but not necessarily, moves in both directions H and Z, while the other grippers labelled 16lt can move not only in H but also in K, all or some of them in accordance with the cutting and operating requirements of the entire machine (H and K being the directions

20 of movement along the pusher crossbeam and perpendicular to it, respectively). In Figure 5f, while the crossbeam 6a moves the boards S1 into position and the gripper 16lt moves in direction K relative to it so as to be able to cut the boards into different lengths according to requirements, the remaining portion of the

25 panel 3 is rotated again with the crossbeam 6 retracted and the related grippers 16 raised in direction Z. Figure 5g shows the boards S1 after they have been positioned by the crossbeam 6a, while the pusher 6 moves the panel 3 forward in direction F again for a further cut 7 into boards S2 (see also Figure 5h). In this

30 case, four boards S2 are shown and therefore (as can be seen better in Figure 5i), one gripper 16t and two grippers 16lt are used. The latter are the grippers that position the boards for the crossways cut into different lengths (notice also that one of the grippers 16lt is holding two boards at the same time), while the

35 grippers that are not used - which this time are those labelled 160t - are positioned at the end of the crossbeam 6a, outside the range of the cutting stroke of the axis 7a. With reference to

Figure 5h again, the crossbeam 6a is shown during its return in direction F3 without the load. In this case, the grippers 16t, which vertically "cover" the area occupied by the boards S2, rise in direction Z so as not to interfere with the boards below, while the remaining grippers 160t, which are idle, are positioned on one side. The number of grippers 160t (and 16t) used and the length of the crossbeam 6a, are calculated in accordance with the working width L5 and the width of the overtravel L6. Similarly, the crossbeam 6 moves into position to catch hold of the next panel or stack of panels 3a which is illustrated in a lighter shade of grey. As mentioned above, Figure 5i shows that the four boards S2 are held by one gripper 16t, which moves in H and by two grippers 161t, which move in H and K, at least one of these being able to hold two or more boards at the same time, and that there are three grippers 160t lying idle on one side of the crossbeam 6a. Figure 5i also shows that the panel 3a is cut lengthways at 7 so as to be further divided into boards S3 that differ in width from boards S2 since successive panels can be cut according to completely different patterns. In Figure 5j, the crossbeam 6a is again returning in direction F3 without the load and with the grippers 16t raised above the boards S3 and the grippers 160t in the idle position on one side of the crossbeam 6a. In the meantime, the next panel 3b is being handled by the crossbeam 6. In Figure 5k, the cutting axis 7a is already working on the boards S3, with two grippers 16t holding the first board, (the larger one) and only one gripper 161t, holding the other two boards (the thinner ones). In the meantime, panel 3b is being sawn lengthways at 7.

Figures 5l to 5u show a machine with two cutting axes that works in the same way as the one just described but with crossbeam 6 of the lengthways section having at least one gripper 161 that can move both in H and in K so as to be able to handle two different panels 3h, 3k placed side by side. In Figure 5m, the two grippers 16 and 161 are pushing the panel 3h in direction F towards the cutting axis 7 which divides the panel 3h into a plurality of boards S4, the latter being then transferred to the crossbeam 6a. The crossbeam 6, now free, can pick up the other panel 3k. In Figure 5o, while the boards S4 are cut at right

angles to the final axis 7a, the panel 3k cut lengthways into boards S5. In the meantime, other panels 3m, 3n have been fed into the machine. In Figure 5p, while the boards S5 are cut crossways, the panel 3m is turned through 90° on the table of the lengthways section of the machine. In Figure 5q, the boards S5 are cut crossways into different lengths, the panel 3m is cut into boards S6 and the panel 3n is picked up by the crossbeam 6. Other panels 3p (already cut into two boards) and 3q are fed in from the loading table. Next, as shown in Figure 5r, while the boards S6 approach the final crossways cutting line, the panel 3n is cut lengthways into boards S7 and the crossbeam 6 transfers the twin-board panel 3p to the lengthways cutting line 7. As shown in Figure 5s, the boards S7 are cut crossways into different lengths and the panel 3p lengthways into boards of different widths at 7. Lastly, Figure 5u shows the latter panel being fed out of the machine after being cut, while the panel 3q is being fed to the cutting line 7.

Thus, thanks to the controlled movements of one or more pickup elements 16, the machine can cut panels, even panels placed edge to edge, into boards of different lengths in a single cutting operation. This concept is clarified further by Figures 6a to 6f which illustrate six steps in the operating cycle of a panel sawing machine equipped with at least one pickup element 16a, closest to the reference line RF, this time on the right, which can move backwards and forwards in direction K.

With reference to Figures 6a to 6f, the numeral 6 indicates the movable pusher, 7 the sawing device, 7-7 the cutting axis, and 3a and 3b two panels to be cut having different widths, equal total lengths (since they are derived from the same starting panel) but cut crossways along different lines to make different sized finished parts, labelled 40 and 41, respectively. In these drawings, the dashed lines on the panels indicate the lines along which they are to be sawn. The drawings show clearly that the boards 40 and 41 differ in length: the boards 41 on the right-hand panel are shorter than the boards 40 on the left-hand panel. The higher or lower number of parts 40 or 41 for each panel can be inverted with respect to the reference line RF. Figure 6a in

particular shows that the lines along which the two panels 3a and 3b will be cut do not coincide.

5 The first step in the panel cutting cycle (Figure 6a) is to drive the pusher 6 in such a way as to move the panels into position for the trimming cut. Trimming may not always be required.

10 For the second cut to be made in the panels (Figure 6b), the pusher 6 is moved forward and, at the same time, the right-hand panel 3b is moved backwards relative to it by the related pickup elements 16a so as to make the cutting lines of the two panels coincide.

For the third cut (Figure 6c), the right-hand panel is moved further back and for the fourth cut (Figure 6d) further back again.

15 The fifth cutting operation (Figure 6e) is applied only to the right-hand panel 3b and for it to be performed, the right-hand panel must be moved forward while keeping the pusher 6, and hence the left-hand panel 3a, in the same position.

20 The sixth and last cut (Figure 6f) is made in the same way as the first three.

It is evident, therefore, that by appropriately combining and programming the lengthways, crossways and vertical movements of the pusher and pickup elements, it is possible to simultaneously feed two or more panels, placed side by side, to a saw which cuts them into a large number of boards differing in size (both in length and width) using a relatively small number of cutting operations and hence saving a considerable amount of time.

25 The object of the present invention is achieved by the fact that the pusher crossbeam or crossbeams are not simply passive operating means but form part of an automated system whose essential parts, namely, the pickup elements, adjust automatically to the size and type of pickup of the panels or boards. Indeed, each pickup element can be regarded as a prehensile robotized device which can move in a line parallel to the axis of the crossbeam, in a line perpendicular to the axis of the crossbeam and in a vertical line, all three of these controlled movements not being applied necessarily to all the pickup elements at the

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same time but each one to one or more of the elements independently of the others, depending on the requirements connected with machine configuration.

Another distinctive feature of the invention is the use of a rotation device that is extremely simple in construction and that works as follows:

- The pusher moves the panel (or stack) to a preset position.
- The grippers open.
- The pusher moves back a little way.

The rotation element R grips the corner of the panel and, thanks to its jointed mounting, rotates the panel by moving lengthways in a straight line in direction F1 acting in combination with a reference element B1 that moves in a line at right angles to direction F1.

- During this operation, the pusher moves to a preset position defined in terms of the panel dimensions.

If the panel has to be rotated again after the pre-cuts have been made, this is done as follows:

- The pusher moves back in direction F1, while holding the panel, in such a way as to move the remaining portion of the panel to a preset position.

- The grippers open.

- The pusher moves back a little way.

The rotation element R grips the corner of the panel and, with its jointed mounting acting as a pivot, waits for the reference element B1 to turn the panel by pushing it in a line at right angles to the forward and reverse feed directions F, F1.

- The rotation moves in direction F in synchrony with the reference element B1 to complete the 90° rotation.

The invention described can be subject to numerous modification in its constructional and application details but without thereby departing from the scope of the inventive concept as claimed below.

Claims

1. A panel sawing machine comprising: a horizontal table (5) to support at least one panel (30; 3a, 3b) to be cut; at least one movable device (6; 6a) designed to push the panel along the table in a feed direction (F; F2) or in a direction (F1; F3) opposite to this, in such a way as to feed a sawing device (7; 7a) and/or a rotation device (R), said sawing device (7; 7a) being designed to cut the panel (30; 3a, 3b) into two or more smaller boards (31; 4a, 4b) in a direction at right angles to the feed direction (F; F2), the movable device (6; 6a) being equipped with at least one pickup element (16) that holds the rear edge of the panel in position while it is being sawn, the machine being characterized in that the pickup element (16) is mounted on the movable device (6; 6a) in such a way that drive means (36) can move it in a horizontal direction (H) at right angles to the feed direction (F; F2).

2. The machine according to claim 1, characterized in that the pickup element (16) slides in a guide (15) that is integral with the movable device (6; 6a) and at right angles to the feed direction (F; F2).

3. The machine according to claim 1, characterized in that the movable device (6; 6a) is equipped with two or more of said pickup elements (16) mounted side by side in a horizontal direction (H) at right angles to the feed direction (F; F2), at least one of them being mounted on the movable device (6; 6a) in such a way that it can move in direction (H).

4. The machine according to claim 3, characterized in that at least one of the pickup elements, the one labelled (161), is mounted on the movable device (6; 6a) in such a way that drive means (38) can move it in the feed direction (F; F2) in both directions (K) relative to the movable device itself.

5. The machine according to claim 1, characterized in that the movable device (6; 6a) is equipped with two or more of said pickup elements (16, 161) mounted side by side in a horizontal direction (H) at right angles to the feed direction (F; F2), of which at least one (16) is mounted on the movable device (6; 6a) in such a way that it can move in direction (H) at right angles to the feed direction (F; F2), and at least one (161) is mounted on the movable device (6; 6a) in such a way that drive means (38) can move it in the feed direction (F; F2) in both directions (K) relative to the movable device itself.

6. The machine according to claim 1, characterized in that the movable device (6; 6a) is equipped with two or more of said pickup elements (16, 161, 162) mounted side by side in a horizontal direction (H) at right angles to the feed direction (F; F2), of which at least one (16) is mounted on the movable device (6; 6a) in such a way that it can move in direction (H) at right angles to the feed direction (F; F2), at least one (161) is mounted on the movable device (6; 6a) in such a way that drive means (38) can move it in the feed direction (F; F2) in both directions (K) relative to the movable device itself, and at least one (162) is mounted on the movable device (6; 6a) in such a way that drive means (39) can move it up and down in the vertical direction (Z).

7. The machine according to claim 1, characterized in that the movable device (6) forms part of a panel sawing machine with a single lengthways cutting axis (7) and is equipped with two or more of said pickup elements (16, 161) mounted side by side in a horizontal direction (H) at right angles to the feed direction (F), at least one of which is mounted on the movable device (6) in such a way that it can move in direction (H).

8. The machine according to claim 7, characterized in that at least one of the pickup elements, the one labelled (161), is mounted on the movable device (6) in such a way that drive means

(38) can move it in the feed direction (F) in both directions (K) relative to the movable device itself.

9. The machine according to claim 7, characterized in that the movable device (6) is equipped with two or more of said pickup elements (16, 161) mounted side by side in a horizontal direction (H) at right angles to the feed direction (F), of which at least one (16) is mounted on the movable device (6) in such a way that it can move in direction (H) at right angles to the feed direction (F), and at least one (161) is mounted on the movable device (6) in such a way that drive means (38) can move it in the feed direction (F) in both directions (K) relative to the movable device (6) itself.

10. The machine according to claim 7, characterized in that the movable device (6) is equipped with two or more of said pickup elements (16, 161, 162) mounted side by side in a horizontal direction (H) at right angles to the feed direction (F), of which at least one (16) is mounted on the movable device (6) in such a way that it can move in direction (H) at right angles to the feed direction (F); at least one (161) is mounted on the movable device (6) in such a way that drive means (38) can move it in the feed direction (F) in both directions (K) relative to the movable device itself; and at least one (162) is mounted on the movable device (6) in such a way that drive means (39) can move it up and down in the vertical direction (Z).

11. The machine according to claim 1, characterized in that the movable device (6, 6a) forms part of a panel sawing machine with two cutting axes, a lengthways cutting axis (7) and a crossways cutting axis (7a) related to a movable device (6) and (6a), respectively, each one of which is equipped with two or more of said pickup elements (16, 161) mounted side by side in a horizontal direction (H) at right angles to the feed directions (F) and (F2) respectively, at least one of the pickup elements of each movable device being mounted on the respective movable device (6; 6a) in such a way that it can move in direction (H).

12. The machine according to claim 11, characterized in that at least one of the pickup elements on each movable device (6; 6a), the one labelled (161), is mounted on the respective movable device in such a way that drive means (38) can move it in the feed direction (F; F2) in both directions (K) relative to the movable device itself.

13. The machine according to claim 11, characterized in that each movable device (6; 6a) is equipped with two or more pickup elements (16, 161) mounted side by side in a horizontal direction (H) at right angles to the feed direction (F; F2), of which at least one (16) is mounted on the movable device (6; 6a) in such a way that it can move in direction (H) at right angles to the feed direction (F; F2), and at least one (161) is mounted on the movable device (6; 6a) in such a way that drive means (38) can move it in the feed direction (F) in both directions (K) relative to the movable device (6) itself.

14. The machine according to claim 11, characterized in that each movable device (6; 6a) is equipped with two or more of said pickup elements (16, 161, 162) mounted side by side in a horizontal direction (H) at right angles to the feed direction (F; F2), of which at least one (16) is mounted on the movable device (6; 6a) in such a way that it can move in the horizontal direction (H) at right angles to the feed direction (F; F2); at least one (161) is mounted on the movable device (6; 6a) in such a way that drive means (38) can move it in the feed direction (F; F2) in both directions (K) relative to the movable device itself; and at least one (162) is mounted on the movable device (6; 6a) in such a way that drive means (39) can move it up and down in the vertical direction (Z).

15. A method for cutting panels in panel sawing machines that comprise: a horizontal table (5) to support at least one pair of panels (3a, 3b, ...3n) to be cut; a movable device (6; 6a) designed to push the panel along the table in a feed direction (F;

F2) to feed a sawing device (7; 7a) designed to cut the panels (3a, 3b, ... 3n) into two or more smaller boards (40, 41, ... 4N) in a direction at right angles to the feed direction (F; F2), the movable device (6; 6a) being equipped with at least two pickup elements (16a, 16b, ... 16n) that hold the rear edge of each panel in position while it is being sawn, the method being characterized in that:

- the pickup elements (16a, 16b, ... 16n) used to implement it are mounted on the movable device (6; 6a) in such a way that all of them, except one, if necessary, can be moved by drive means (36) in a horizontal direction (H) at right angles to the feed direction (F; F2);

- at least one of the pickup elements (16b...16n-1) is mounted in such a way that drive means (38) can move it in the feed direction (F; F2) in both directions (K) relative to the movable device;

- each panel (3a, 3b, ... 3n) is picked up by a pickup element (16a, 16b, ... 16n) and that the pickup element (16b...16n-1) is moved in the feed direction (F; F2) in both directions (K) relative to the movable device in such a way as to position the panels (3a, 3b, ... 3n) so that the lines along which they have to be cut are aligned before they are fed to the sawing device (7; 7a).

16. The method according to the previous claim, characterized in that:

- the pickup elements (16a, 16b, ... 16n) used to implement it are mounted on the movable device (6; 6a) in such a way that all of them, except one, if necessary, can be moved by drive means (36) in a horizontal direction (H) at right angles to the feed direction (F; F2);

- at least one of the pickup elements (16b...16n-1) is mounted in such a way that drive means (38) can move it in the feed direction (F; F2) in both directions (K) relative to the movable device;

- at least one of the pickup elements (16b...16n-1) is mounted in such a way that drive means (39) can move it in a vertical direction (Z);

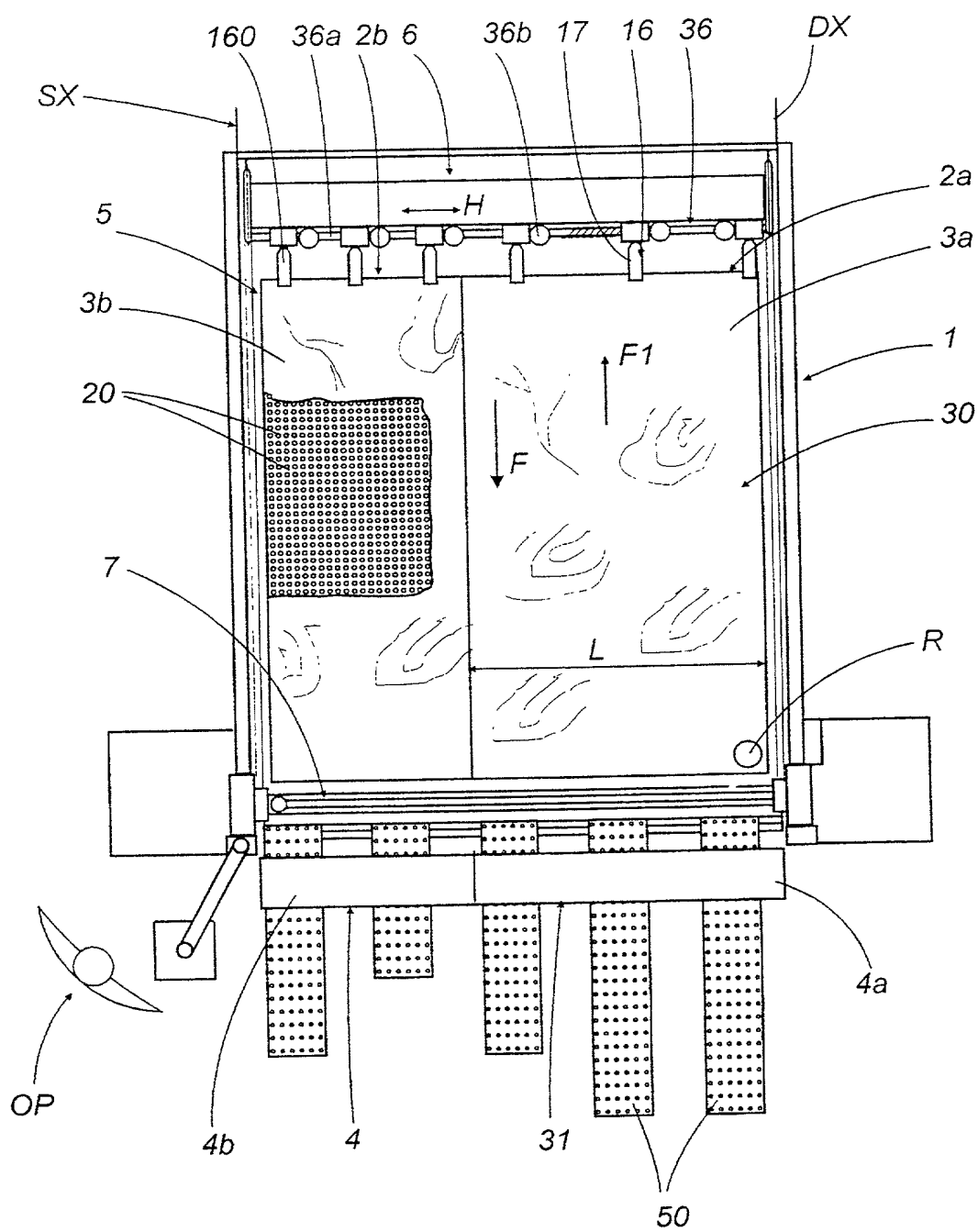
said movements making it possible for the movable device (6; 6a) to return in a direction opposite the forward feed direction (F; F2) and pass over a panel positioned on the table (5); with some of the pickup elements, the ones labelled (162), having risen to a given height along the axis (Z) so as not to interfere with said panel, and some of the pickup elements, the ones labelled (161), having moved crossways in the horizontal direction (H) to a lateral position outside the area occupied by the panel.

Abstract of the Invention

A panel sawing machine comprises a horizontal table (5) on which a movable device (6) pushes a stack of panels (3a) in a forward direction (F) or reverse direction (F1) to feed a sawing device (or to a device for rotating the stack) which divides the panel up into two or more smaller boards. The pusher (6) is equipped with two or more pickup elements (16) that hold the rear edge of the stack in position during positioning and/or sawing operations. The pickup elements (16) are mounted on the movable device (6) in such a way that they can run in guides (15, 15a, 15b) in the following three directions, respectively: horizontal at right angles to, and horizontal parallel to, the forward direction (F) or the reverse direction (F1), and vertical.

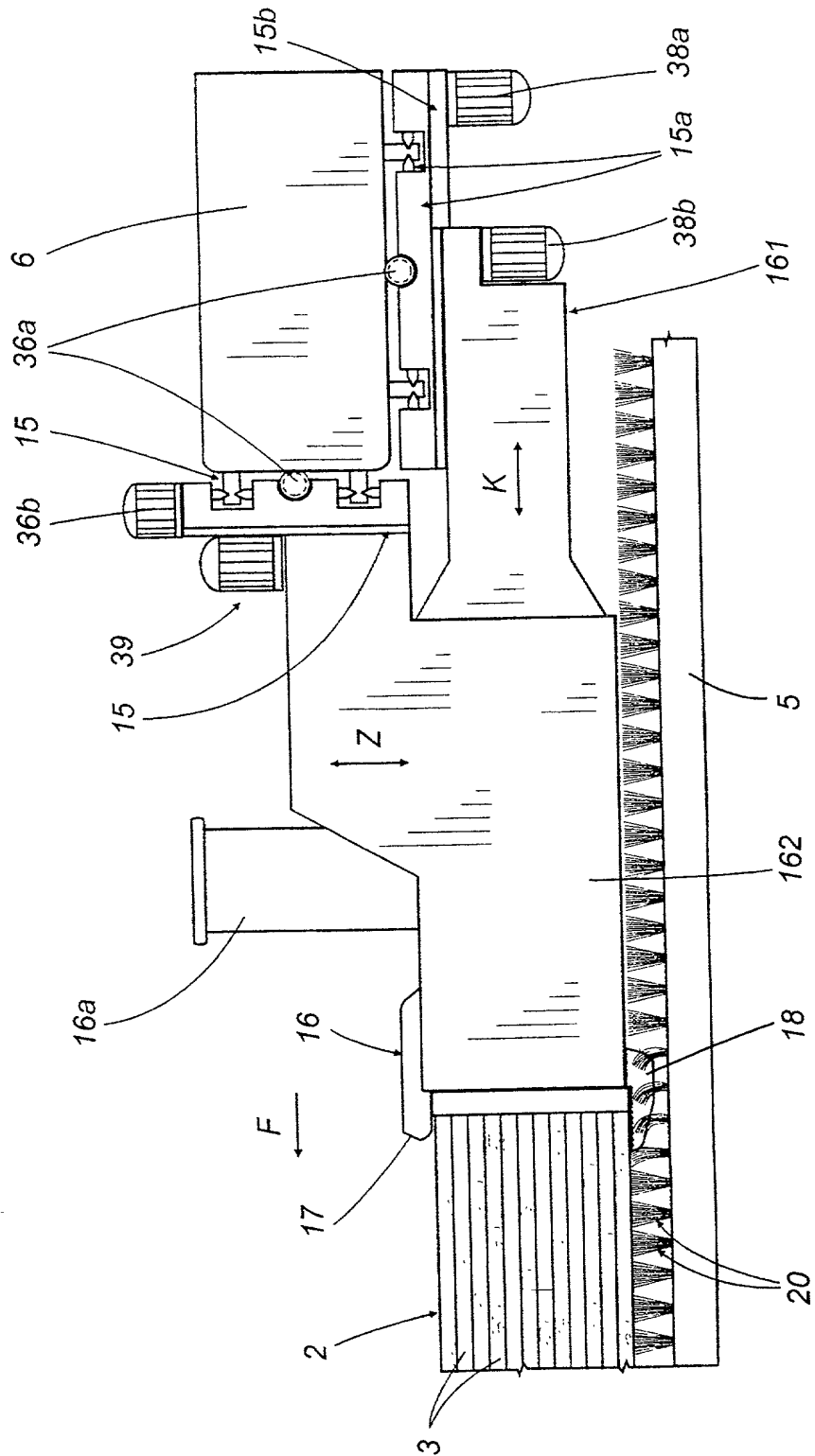
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FIG. 1



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FIG.2



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FIG. 3a

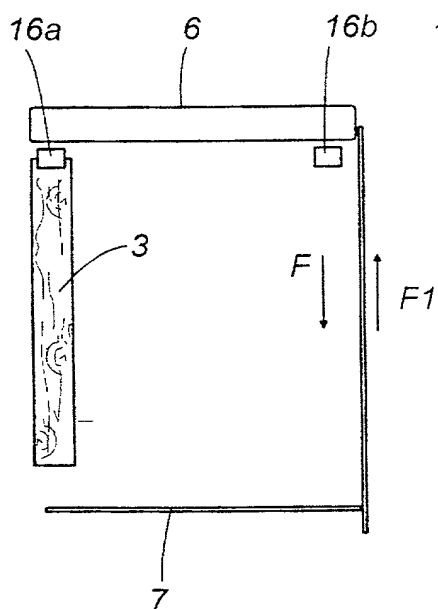


FIG. 3b

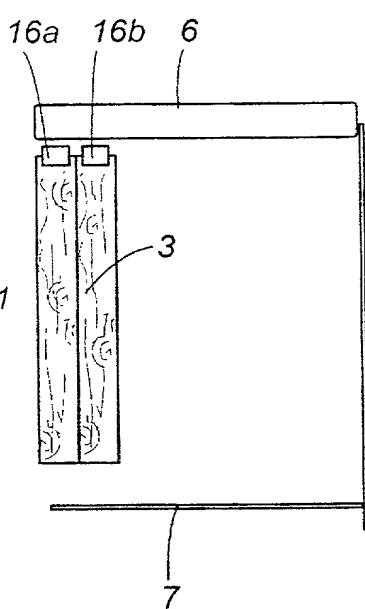


FIG. 3c

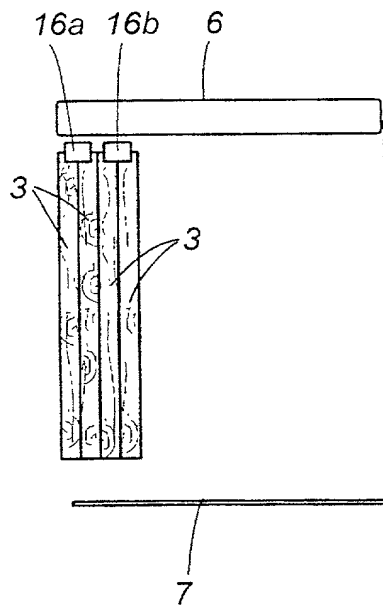


FIG. 3d

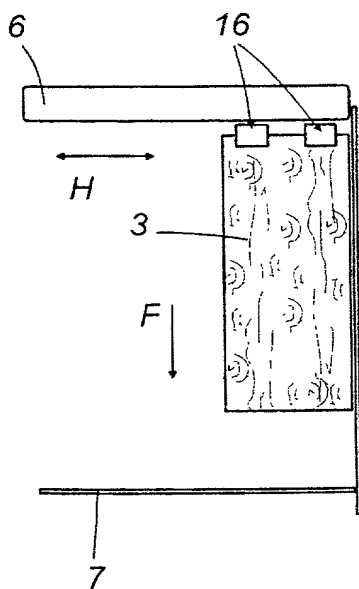


FIG. 3e

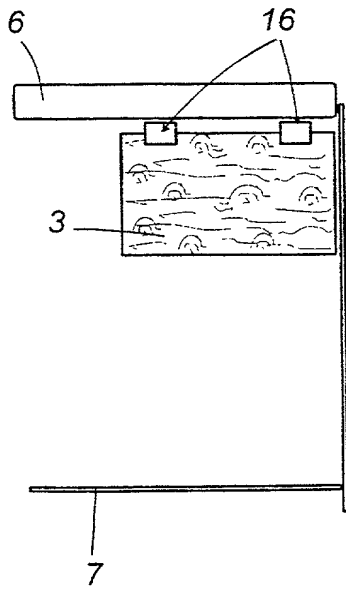
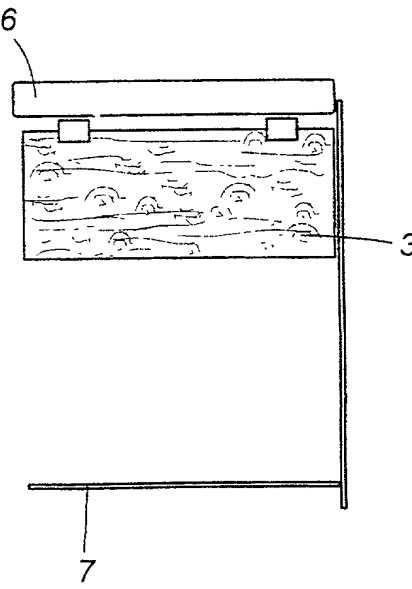


FIG. 3f



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FIG.4a

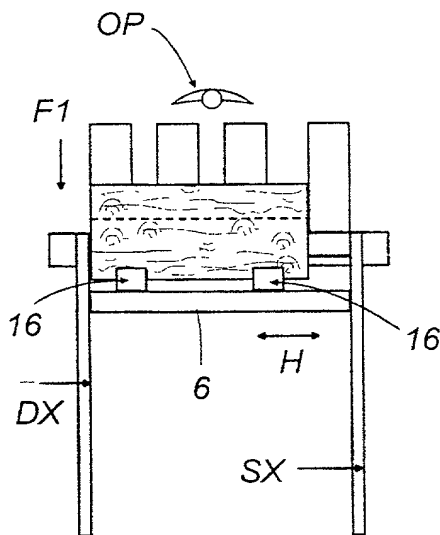


FIG.4b

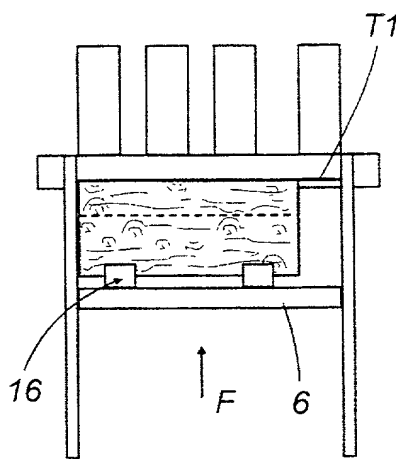


FIG.4c

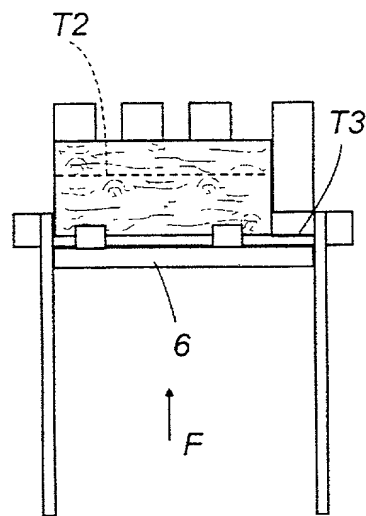


FIG.4d

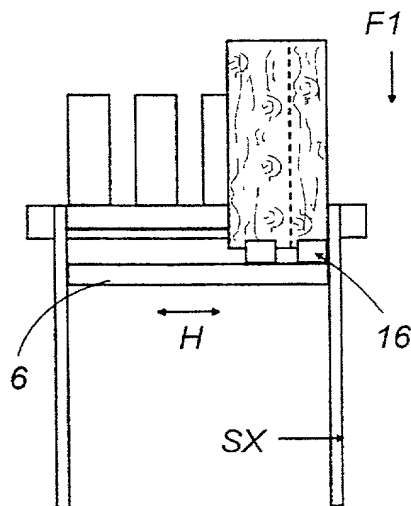


FIG.4e

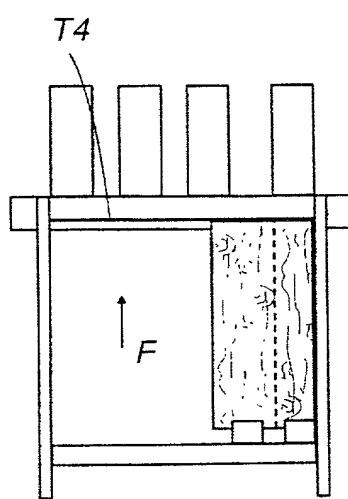
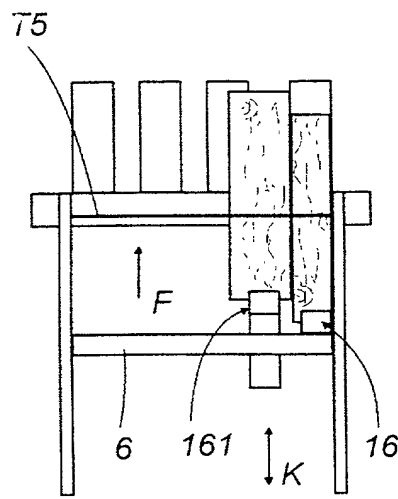


FIG.4f



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FIG. 4g

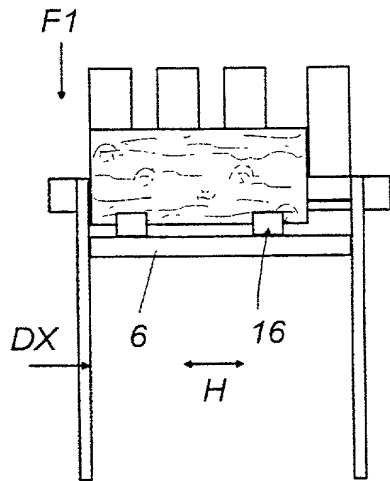


FIG. 4h

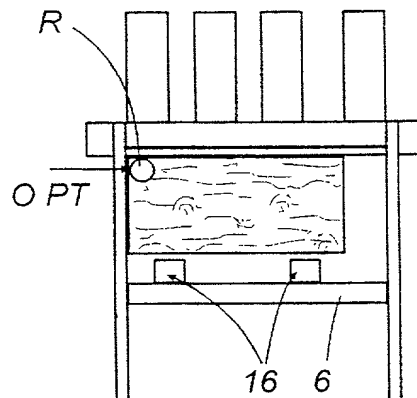


FIG. 4i

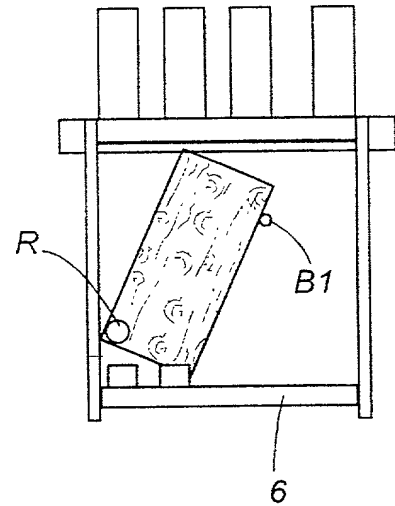


FIG. 4j

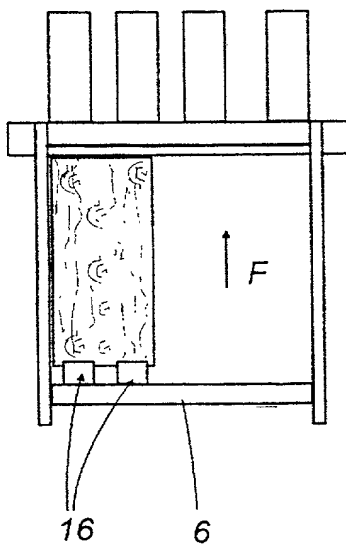


FIG. 4k

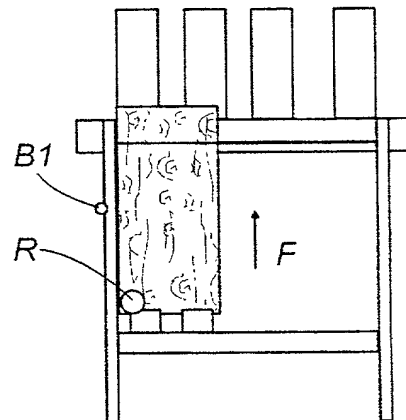
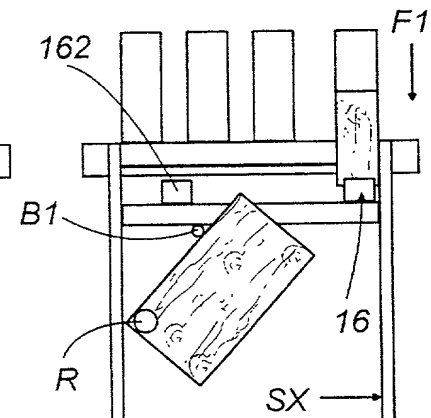


FIG. 4l



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FIG. 4m

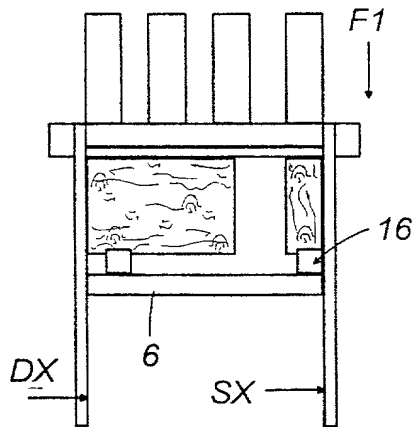


FIG. 4n

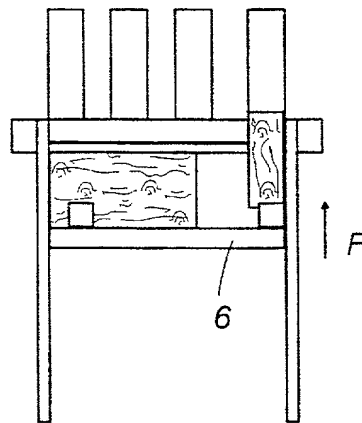


FIG. 4o

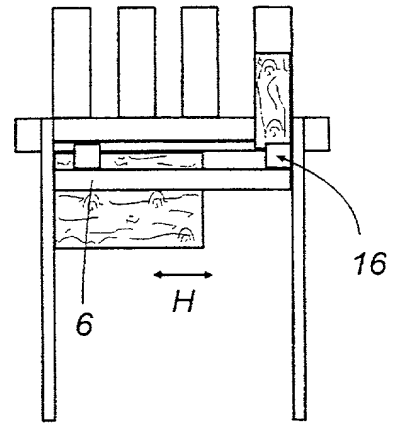


FIG. 4p

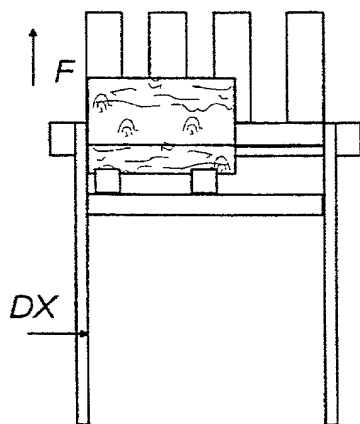


FIG. 4q

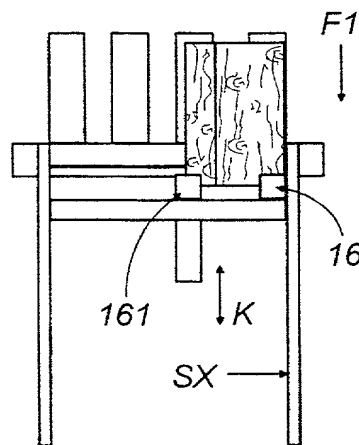
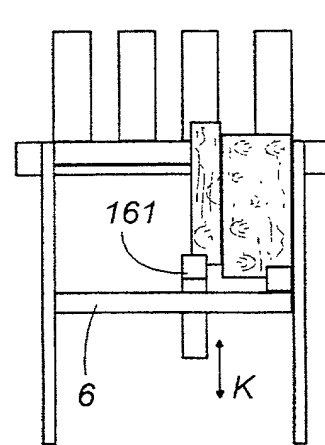


FIG. 4r



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FIG.4u

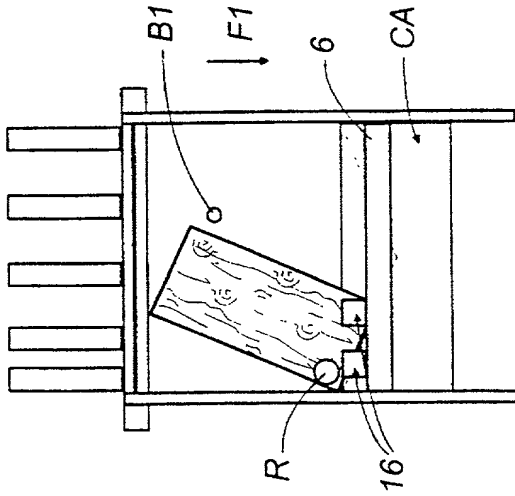


FIG.4x

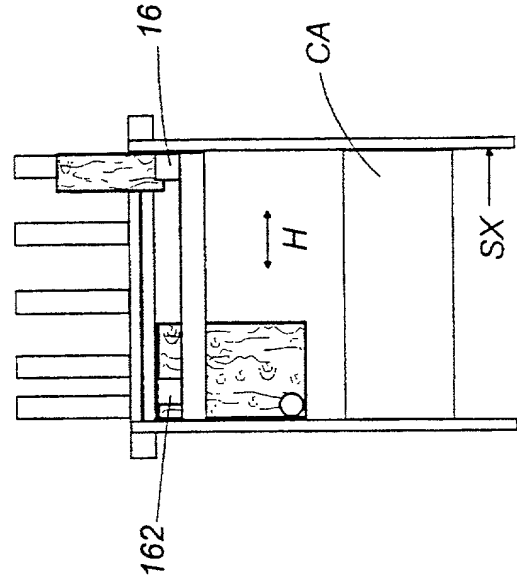


FIG.4t

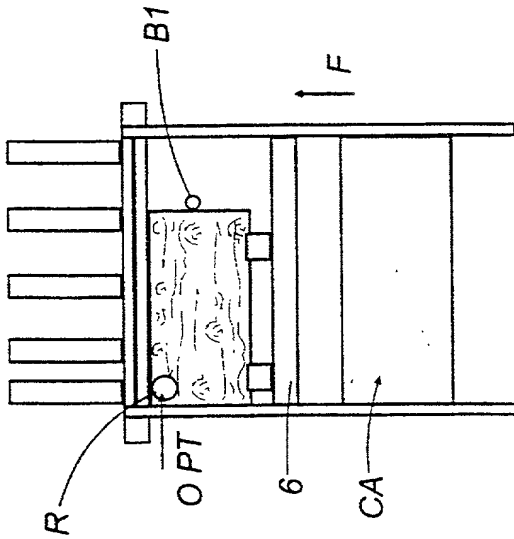


FIG.4w

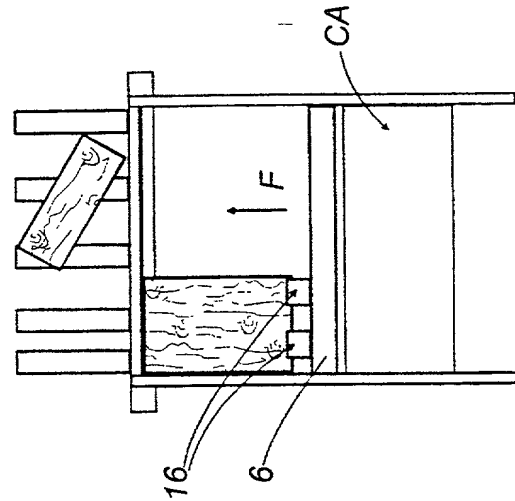


FIG.4s

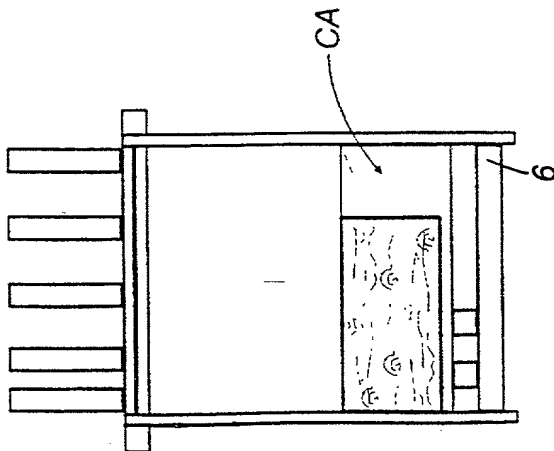
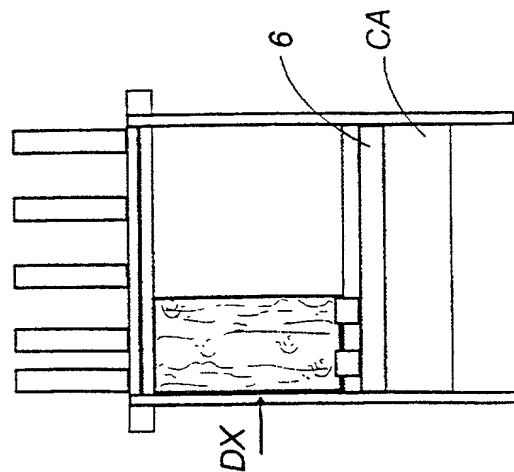


FIG.4v



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FIG. 4y

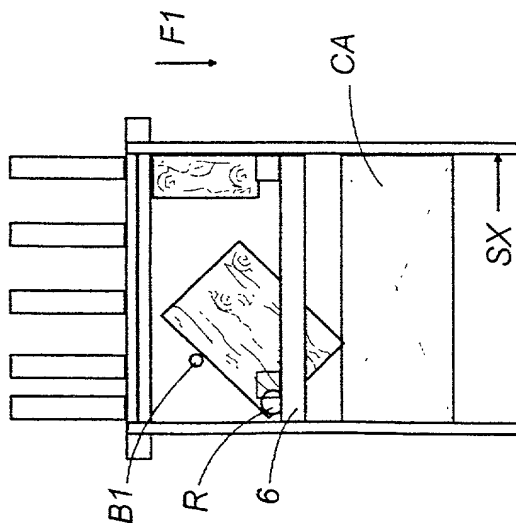


FIG. 4z

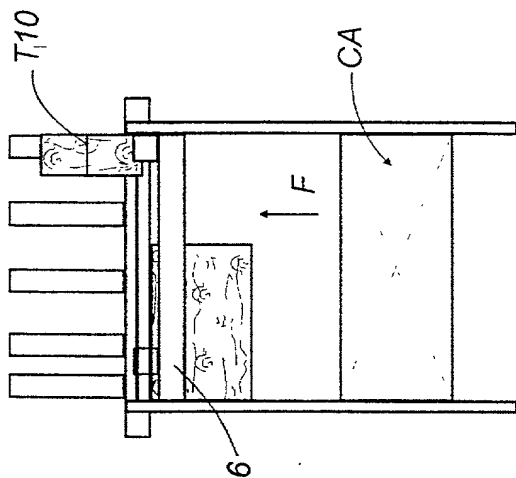


FIG. 4a1

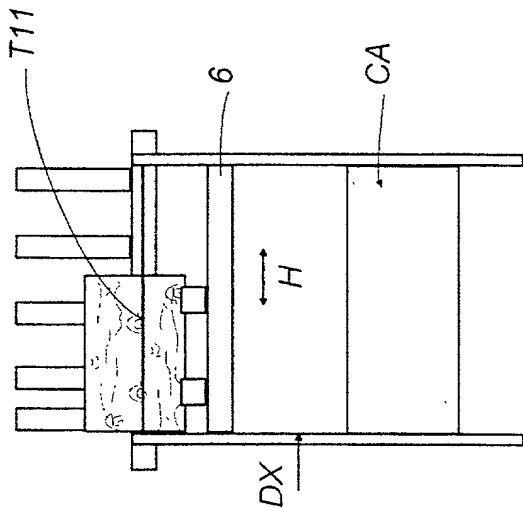


FIG. 4b1

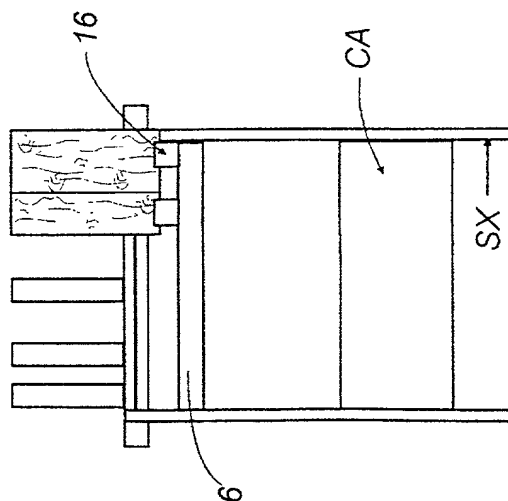


FIG. 4c1

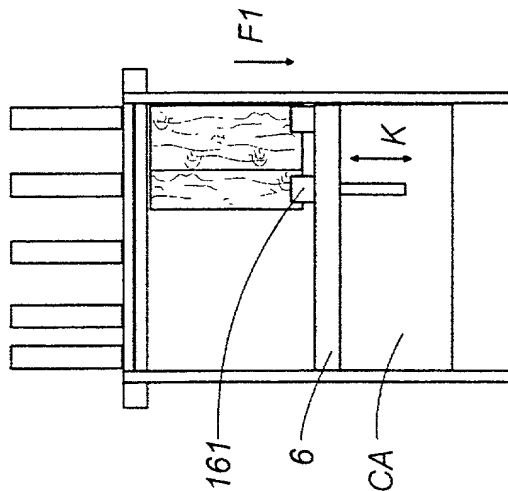
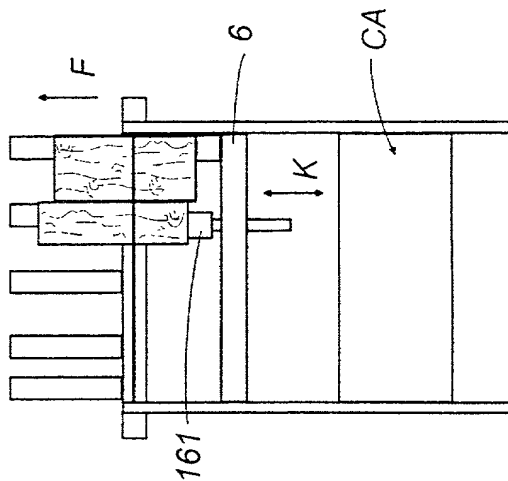
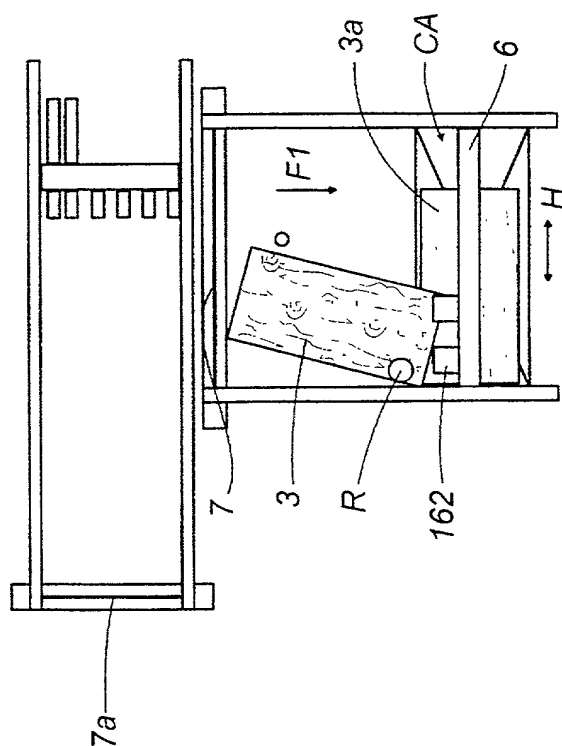
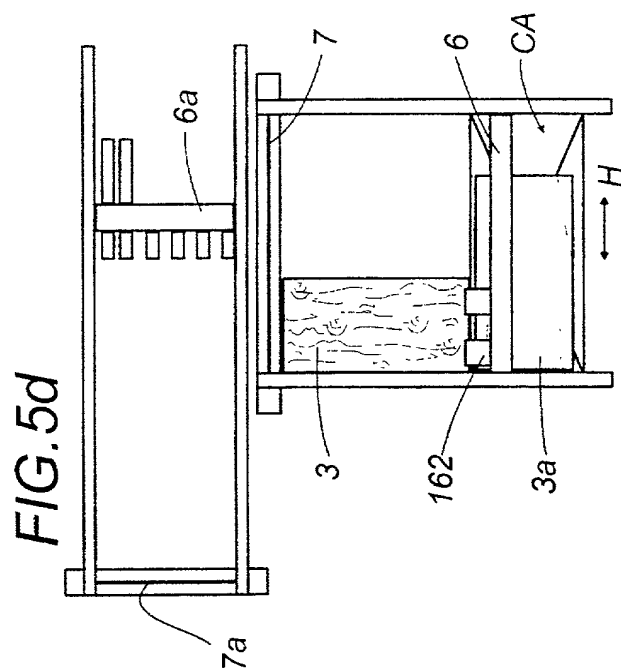
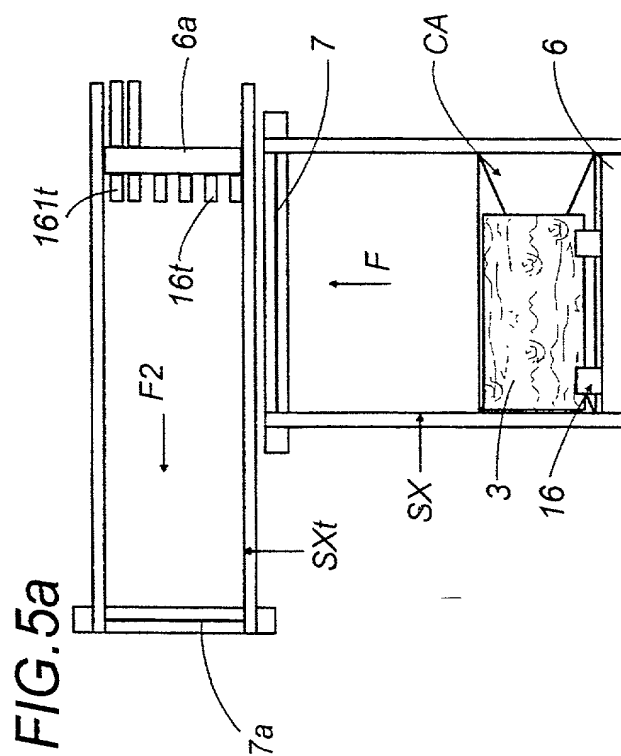
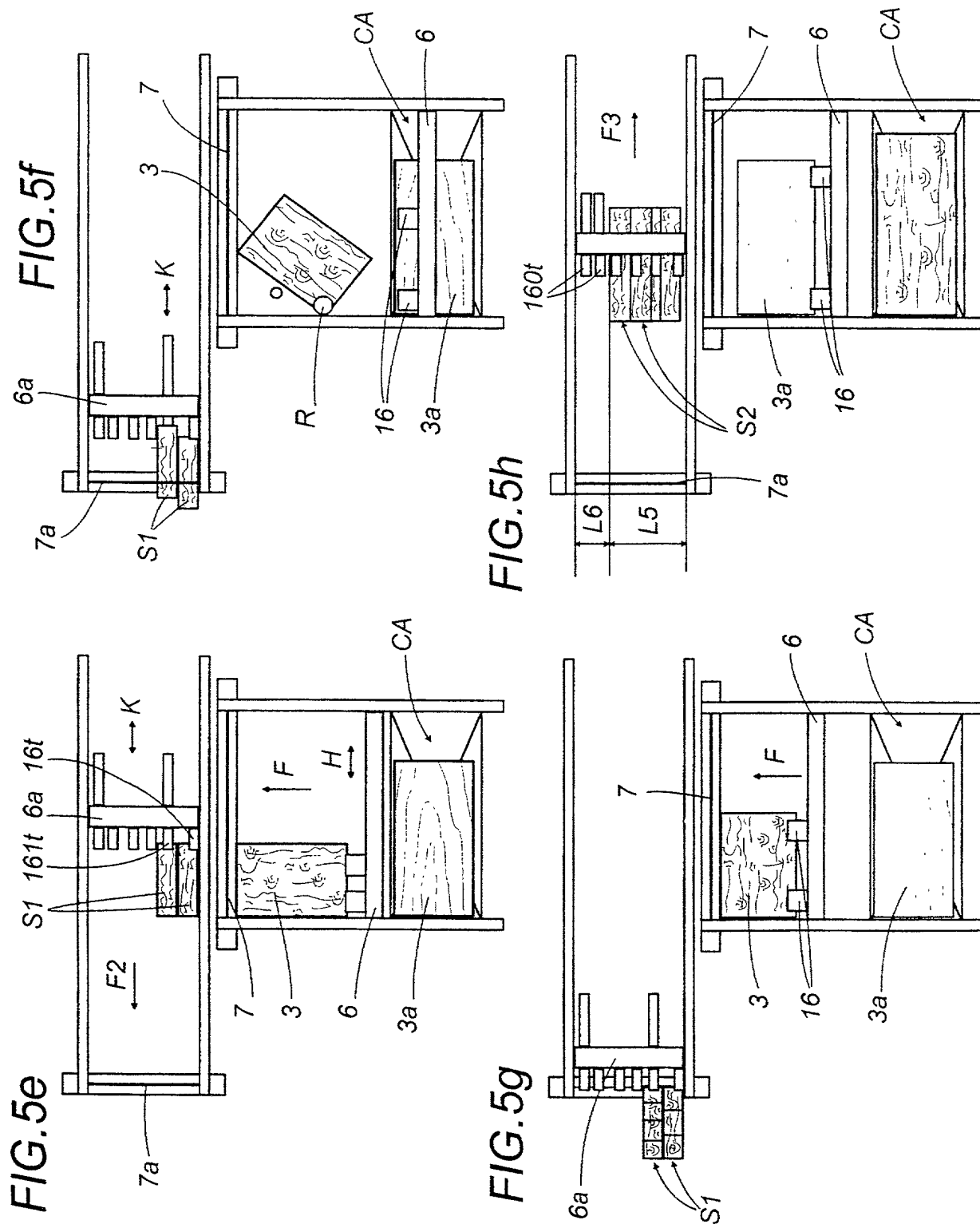


FIG. 4d1





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FIG.5j

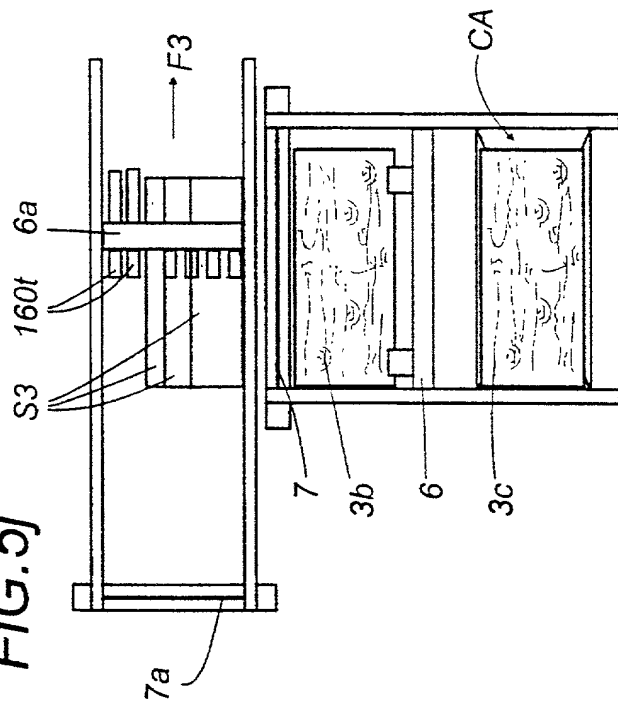


FIG.5i

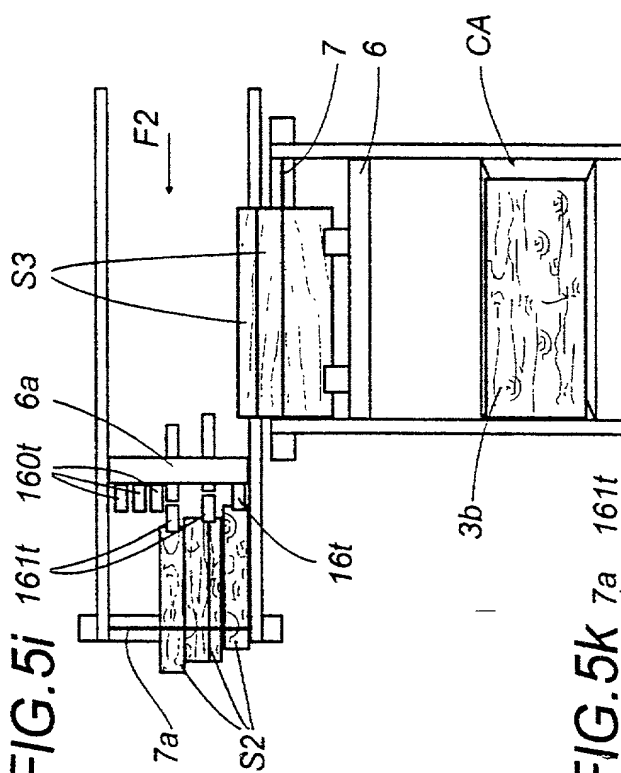
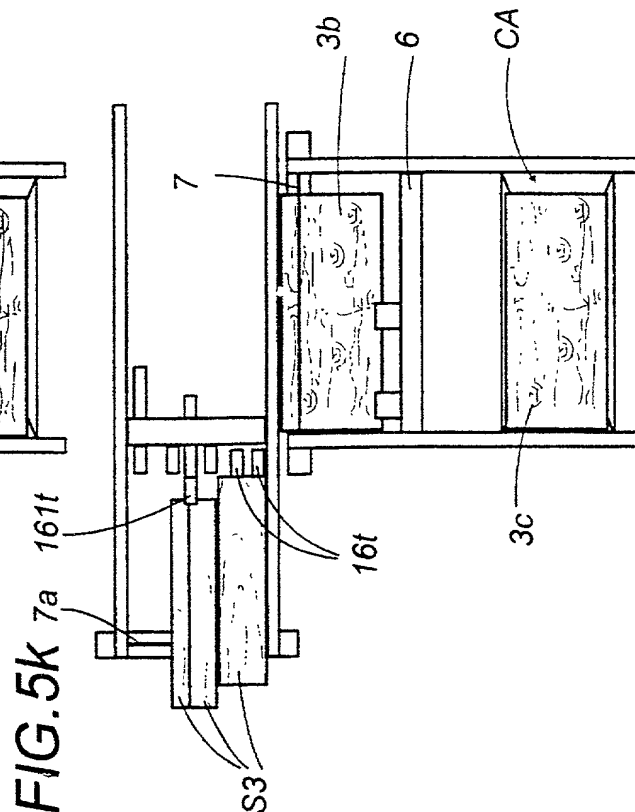


FIG.5k



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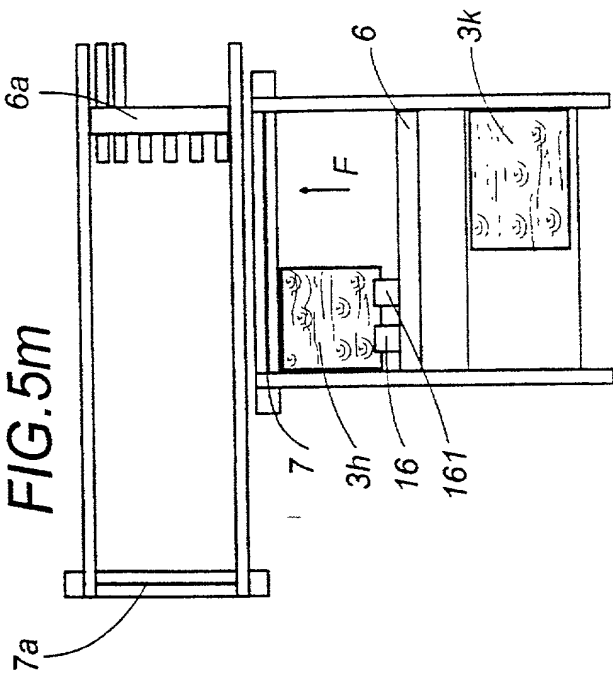


FIG. 5m

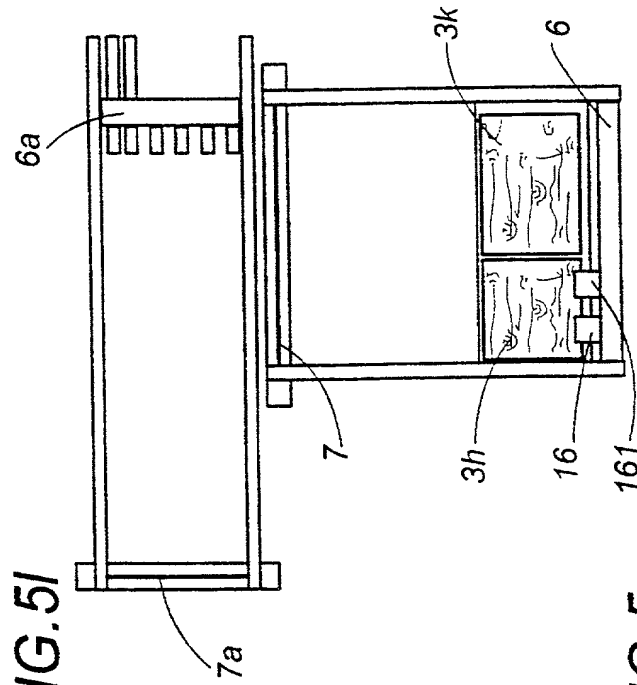


FIG. 5l

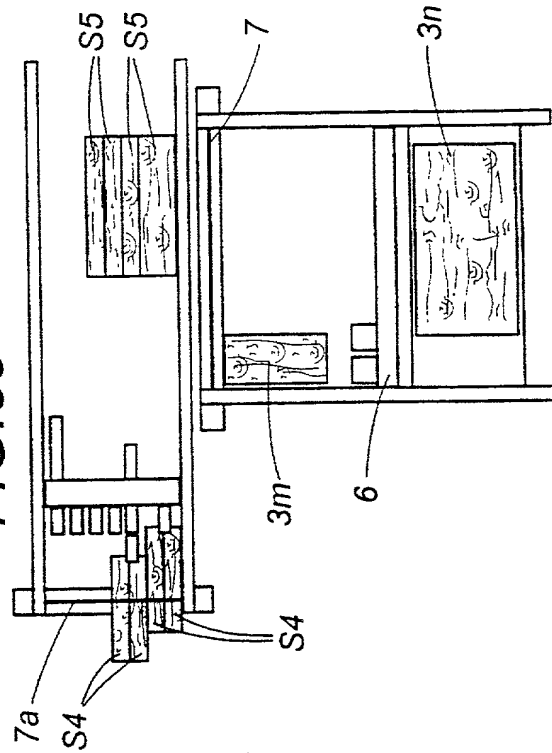


FIG. 5o

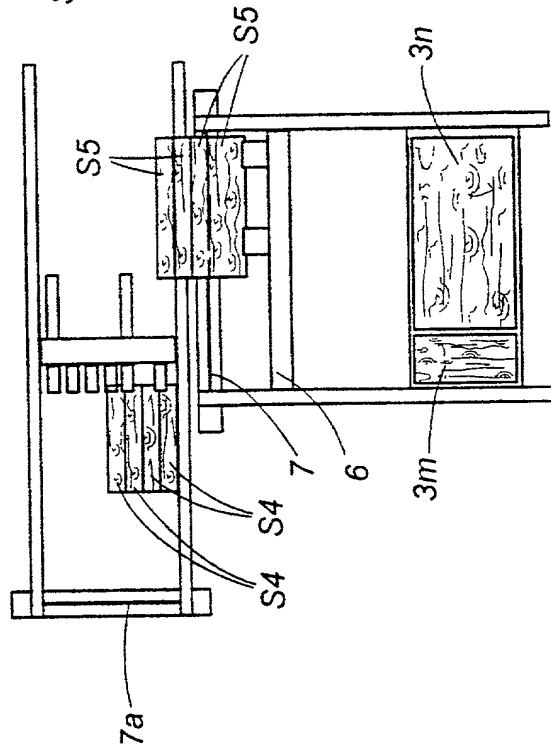
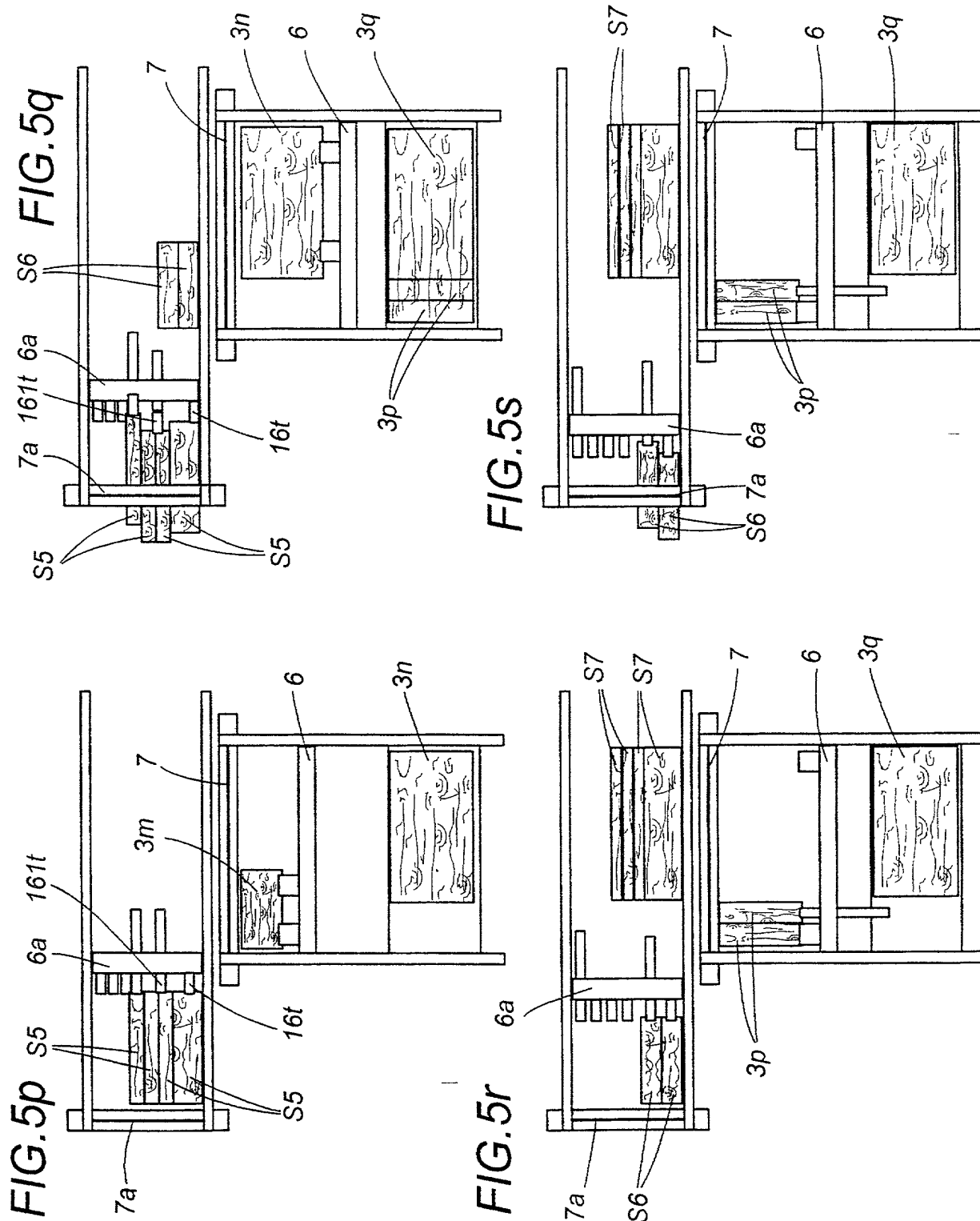


FIG. 5n

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FIG.5u

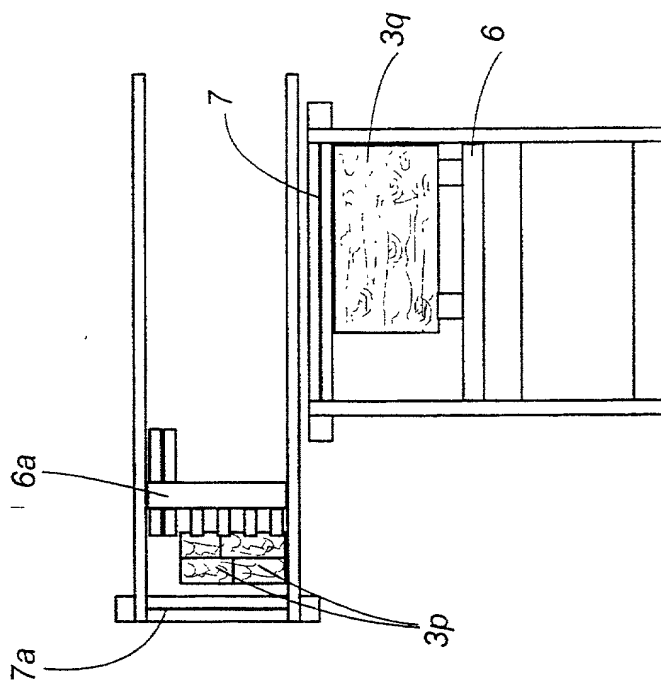
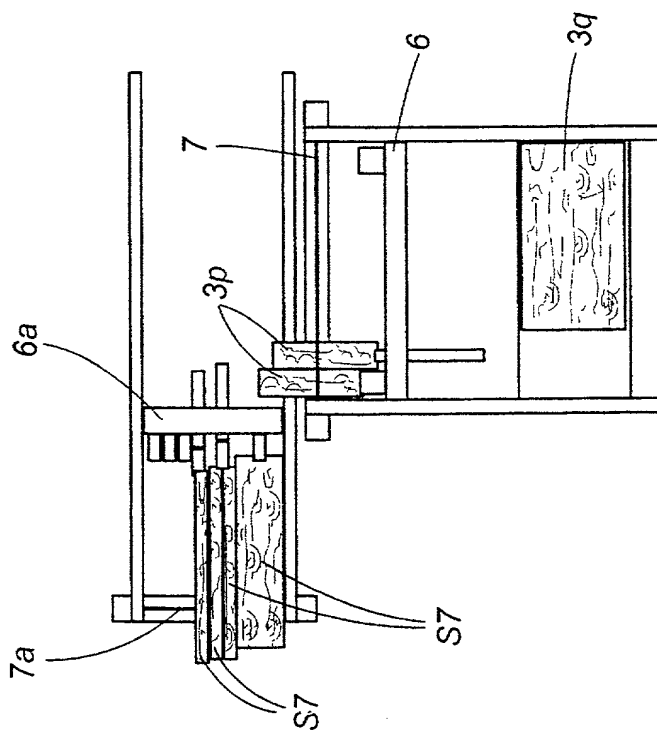
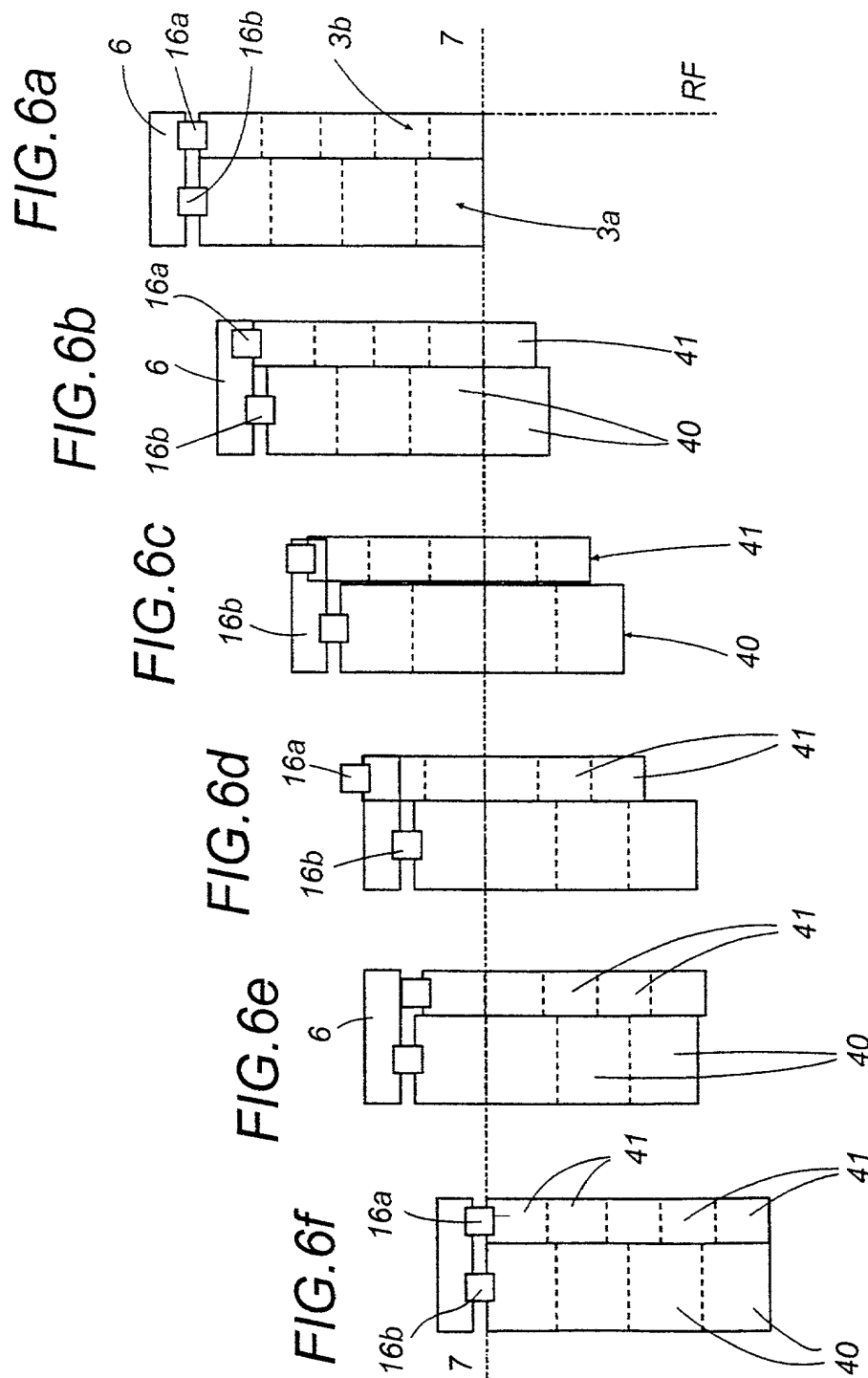


FIG.5t





DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Method and machine for sawing panels with laterally  
movable pusher

the specification of which:

☐ is attached hereto.

☒ was filed on December 17, 1998  
as ~~U.S. Serial No.~~ PCT/IB98/02046  
PCT Appln. No.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's

certificate having a filing date before that of the application on which priority is claimed:

<u>BO97A 000740</u> (Number)	<u>ITALY</u> (Country)	<u>24/12/1997</u> (Day/Month/Year Filed)
<u>                    </u> (Number)	<u>                    </u> (Country)	<u>                    </u> (Day/Month/Year Filed)
<u>                    </u> (Number)	<u>                    </u> (Country)	<u>                    </u> (Day/Month/Year Filed)

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below:

<u>                                    </u> (Application Number)	<u>                                    </u> (Filing Date)
<u>                                    </u> (Application Number)	<u>                                    </u> (Filing Date)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Serial No.)	(Filing Date)	(Status)
(Serial No.)	(Filing Date)	(Status)
(Serial No.)	(Filing Date)	(Status)

I hereby appoint the following attorneys to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected therewith:

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Cleveland, Ohio 44114-2518

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or

imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

1-00  
Piergiorgio BENUZZI  
Full Name of First Inventor

[Signature]  
Inventor's Signature

July 30, 1999  
Date

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Date

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Citizenship

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Full Name of Third Inventor

Inventor's Signature

Date

Residence

Citizenship

Post Office Address

Full Name of Fourth Inventor

Inventor's Signature

Date

Residence

Citizenship

Post Office Address